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THE

NATURAL, STATISTICAL AND CIVIL

HISTORY

OF THE

STATE OF NEW-YORK.

IN THREE VOLUMES.

BY JAMES MACAULEY.

VOLUME I.

NEW-YORK:

PUBLISHED BY GOULD & BANKS,

AND

BY WILLIAM GOULD & CO.

ALBANY.

1829.

A. S. Gould, Printer.

Southern District of New-York, ss.

BE IT REMEMBERED, that on the 16th day of March, A. D. 1829, in the fifty-third year of the Independence of the United States of America, James Macauley, of the said District, has deposited in this office the title of a Book, the right whereof he claims as Author, in the words following, to wit:

"The Natural, Statistical and Civil History of the State of New-York. In Three Volumes. By James Macauley."

In conformity to the Act of Congress of the United States, entitled "An Act for the encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the time therein mentioned." And also to an Act, entitled "an Act, supplementary to an Act, entitled an Act for the encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the times therein mentioned, and extending the benefits thereof to the arts of designing, engraving and etching, historical and other prints."

FRED. J. BETTS,
Clerk of the Southern District of New-York.

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TO THE PUBLIC.

The author, after he had made a draft of his History of the State of New-York, submitted the same to the examination of several literary gentlemen of eminence, in order to obtain their opinion in relation to the propriety of its publication, from whom he received the following letters of commendation.

Letter from Alexander B. Johnson, Esq. of Utica, Oneida Co.

Utica, October 14*th*, 1826.

To James Macauley, Esq.

Sir—The History of the State of New-York is an inadequate title. Your work is rather a chorography of the State, with a copious topography of every city, village, mountain, valley, lake, river, creek and canal; a display of its indigenous and its exotic animate productions, and inanimate; its commerce, manufactures, arts, literature and religion.

Since our States have become members of a great confederacy, the political History of one alone is difficult to indite.

The manner in which you group the kindred natural divisions of the earth, tends much to assist memory, and to the communication of definite information. Your chapter on winds, yielded me much instruction. In short you have sketched out an immense outline. From a careful examination of more than thirty quires of close manuscript, I can say you have collected many important facts; recorded many interesting phenomena; deduced many rational conclusions, and described minutely many sections of country.

That it may be productive of both honour and profit, is the sincere wish of, sir, your respectful and very obedient,

A. B. JOHNSON.

Letter from the Hon. Ezekiel Bacon, Esq. of Utica.

Utica, October 16*th*, 1826.

James Macauley, Esq.

Sir—I have looked over some portion of your manuscript, of a projected History or view of the State of New-York, but have had no sufficient leisure to examine it critically, or with sufficient attention to form a competent opinion of its particular merits. I am, however, satisfied that it embraces

geographical, geological and statistical views of this and the adjoining States, which nothing but great research and industry could have enabled you to collect; many parts of which are new and original, and not, I believe, to be found in any other single work. Yours, respectfully,

E. Bacon.

Letter from the Rev. Dr. H. Davis, President of Hamilton College, Oneida county.

Hamilton College, Nov. 22d, 1826.

James Macauley, Esq.

Dear Sir—I have read, with attention, a considerable part of your manuscript, denominated a History of New-York. It is evident, that your collection of facts, is the result of long continued and patient exertions, and much of careful and minute research.

As to the question of publishing it, I cannot advise you to send it to the press in its present form. It certainly comprises a mass of valuable materials. Were it reduced about one-half of its present number of pages, its matter arranged in the best style and manner, and in some respects corrected, I am of the opinion that it would be found an interesting and useful work.*

Truly and respectfully your friend and humble servant,

H. Davis.

Letter from Dr. Josiah Noyes.

Hamilton College, November 22d, 1826.

James Macauley, Esq.

Dear Sir—From the perusal of various parts of your History of New-York, in manuscript, I consider it as containing a great number of useful facts, arranged on an extensive plan. By some improvements in the style, and a condensation of some parts of it, with the corrections and additions which you will soon be able to make, I am confident it will be rendered a very interesting work.

Very respectfully your friend and humble servant,

Josiah Noyes,

Professor of Chemistry, at Hamilton College.

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* The whole has been copied, and many corrections made since the date of this letter.

Letter from the Hon. Nathan Williams, Esq.

Utica, Feb. 8th, 1827.

To James Macauley, Esq.

Sir—I have perused some chapters of your work, upon the Civil and Natural History of the State of New-York, and have arrived at the conviction, that if the whole work is written as well as the parts I have examined, it cannot fail to be highly interesting and useful to the present and rising generations. When we consider the wide range you have taken in assisting our knowledge of the most important part of North America, and the great labour and diligence that the work must have cost you, our good wishes, at least, are enlisted in your favour; and for myself, I sincerely say, that I hope you will not only publish it, but that the public approbation of your work will give that reward, which, I think, it will be found to deserve,

Yours, respectfully,

N. Williams.

Letter from Dr. Samuel L. Mitchill.

New-York, June 13th, 1827.

To James Macauley, Esq.

Sir—I write you this note on the subject of your meditated History of New-York. Its present amplitude, the neglect of the early settlers, and the employment of the Dutch tongue, in recording events, have all operated against the full and regular execution of this great work.

I am much pleased to find you have resolution and ability to persevere in a task of so much complication and difficulty.

If I comprehend you rightly, you intend to give both the Natural and Civil History.

The former will occupy your first volume; treating of the mountains, hills, plains, valleys, rivers, lakes, cataracts, climate, winds, and other matters appertaining to this department.

The second volume will comprehend an account of the counties, cities, antiquities, aboriginal population, arrival of emigrants from Europe, and the transactions of the latter to 1750.

Your third volume will comprehend the proceedings from 1750 to 1800. A correct delineation of these several periods, I mean the colonial, the belligerent, and the republican condition of the people, present scope for wide and deep research.

I have listened with interest to the chapters you have read to me. I think the disquisition on the *Red Men*, or Indians,

was very instructive, and highly probable. Really, you seem to have shown that the ancestors of the Toltecans and Mexicans once inhabited the region between Black river and the Arkansaw. I have long been convinced that the Indians of the northern division of our western hemisphere, are *Tartars*, as I am that those of the southern section, are *Malays*. I therefore coincide with your views, that the *Hurons*, *Delawares*, and the kindred tribes which formerly possessed New England, New-York, New-Jersey, and the tract reaching to the Chesapeake bay, were members of this race; and your conclusion that the famous Five Nations, or *Agoneaseah*, who occupied the country south of Lake Ontario, were descended from the Hurons, carries with it all the force that the evidence in such a case will warrant.

If, sir, the other chapters are written as well as those you have submitted to me, I consider the manuscript as a valuable performance.

It would be too much to say you have exhausted all the materials; but it is fair and candid to acknowledge, that your table of contents exhibits a characteristic, and comprehensive outline, which should you be unable to complete in all its details, will pass to your successors as a document of importance.

I conclude with the assurance of my personal regard, and of my wishes for the prosperity of your elaborate undertaking.

SAMUEL L. MITCHILL.

Letter from Dr. Jeremiah Van Rensselaer.

New-York, June 26th, 1827.

Mr. James Macauley,

Sir—At your request, I have examined the chapters of your contemplated work on the Civil and Natural History of the State of New-York.

The plan of your work appears ample and satisfactory, and one which, if properly executed, cannot fail to be duly appreciated. The History of our State, from its early colonization by the Dutch, to the present day, is replete with interest. An authentic and well written narrative of the wars alone, of which our State has been, as it were, the theatre, would form an interesting and valuable work, independent of what are termed the early troubles and Indian wars—the French wars that harrassed our frontiers for more than half of the last century; the war of our independence, and the late war with Great Britain, are fertile themes for the historian.

The Natural History of our State, is a laborious task, and one, which in the present state of our knowledge, may perhaps prove difficult; but in which, I trust you will succeed. Materials for such a work have increased rapidly within the last few years, and by a careful examination and comparison of the works of such naturalists as have attended to the subject, aided by your own observations, during several successive years, I doubt not you will make it an attractive part of your work.

To the merit of what I have seen, I cheerfully offer my testimony. Very respectfully your obedient servant,

JER. VAN RENSSELAER.

Letter from Dr. David Hosack.

New-York, June 27th, 1827.

Dear Sir—As far as my time and engagements have permitted me to read those chapters of your work which you have submitted to my perusal; I very much approve of your general design, and of the outline you have sketched—when the latter may be filled up in the manner some of the subjects have been treated of, I have no doubt your work will prove a valuable accession to the historical publications which have already reflected honour upon our country, and will merit the patronage of the friends of American literature.

Accept, dear sir, my best wishes for your success in the important undertaking in which you have embarked, and believe me to be very respectfully yours,

DAVID HOSACK.

To James Macauley, Esq.

Letter from Dr. James R. Manley.

New-York, June 28th, 1827.

Mr. James Macauley,

Sir—The manuscript portions of your work which you left with me, I have carefully read, and I take great pleasure in bearing my feeble testimony to their merits. Such parts as treat of the Aborigines of this State, their early settlements, their wanderings, wars, occasional conquests, and consequent mutations of sovereignty, are as curious as they are interesting; and give ample evidence of the patience and industry which were necessary to complete your projected History. I think you may indulge the assurance, that the public, and more particularly the citizens of this State, will patronize the work, to an extent which will not disappoint your expectations.

The revision of the work, preceding the publication, will give you the opportunity of correcting those inaccuracies of style which are inseparable from the first draughts of all works of such magnitude on such subjects.

With my best wishes for your success, I subscribe myself yours, sincerely,

JAMES R. MANLEY, M. D.

Letter from Mr. Jas. Renwick, Columbia College, New-York.

2d July, 1827.

Mr. James Macauley has exhibited to me some portions of the manuscript of a History of the State of New-York. To one part of it I have paid some attention, and perused it with care; it is that which relates to the climate. I find that this portion of his work is drawn up with much care and labour, and contains a collection of a mass of valuable facts. Should every other part of this History evince equal industry in the preparation and collection of materials, the whole cannot fail of being a valuable acquisition to such as apply themselves to the study of our local annals.

JAMES RENWICK,

Prof. of Nat. Exp. Phil. and Chem. in Columbia College.

Letter from Dr. Felix Pascalis.

New-York, July 11th, 1827.

To James Macauley, Esq.

Dear Sir—I tender you my humble testimony of the favourable impressions I have received from an examination of some of the important chapters of your projected History of New-York, and I feel convinced that the whole of it will be found instructing and interesting.

The rapid advance of this section of North America, in agriculture, population and commerce, sufficiently prove, that by its soil and climate, the State of New-York is one of the best districts of this great confederacy.

Ancient and modern nations have been much indebted for their prosperity to good statistical books, or travellers' narratives, which, with the report of their good government, have greatly enhanced the value of their natural resources, and their progress of internal improvements. That this may be the result of your publication, I have a sanguine hope; and that it may be justly estimated and patronized by your fellow citizens, is the wish of your respectfully and cordially very humble servant,

FELIX PASCALIS.

TO THE

HON. STEPHEN VAN RENSSELAER, ESQ.

THE PROMOTER OF

AGRICULTURE, COMMERCE, INTERNAL IMPROVEMENTS, AND THE SCIENCES;

THE

NATURAL, STATISTICAL AND CIVIL

HISTORY

OF THE

STATE OF NEW-YORK,

IS MOST RESPECTFULLY INSCRIBED BY THE

AUTHOR.

PREFACE.

Two hundred and fifteen years have passed away, since a few adventurers from Holland formed establishments at New- York and Albany: establishments destined to be the future abodes of civilization, of commerce, of opulence, and of the arts and sciences. Here then the history of the State dates its origin. The circumstances attending the early settlement of this State, like those of the other Atlantic States belonging to the confederation, have not been handed down with so much care and precision, as we could have wished. From the year 1614 to the year 1635, there are very few records remaining in relation to the affairs of the colonists. The encroachments of the colonies of New-England, at the latter period, upon the Dutch possessions on Connecticut river, and shortly after upon those along the Sound, and upon Long Island, gave rise to a series of epistolary correspondence, from which some valuable information is derived. The correspondence was continued for about twenty-nine years, when the English came into possession of the country. From thence to our time, information has, in a measure, increased in a ratio corresponding with the increase of the country.

It is not our design to blame the humble founders of New-York and Albany for not having left us copious memorials of their time. They were surrounded with difficulties, dangers and hardships. They were intent on self-preservation and gain, which are things common to the human family. They did not imagine that they were laying the foundation of a great

opulent, agricultural, commercial and populous State. They did not imagine that ere long, the little village of New Amsterdam, enclosed as it then was with pickets and confined to a few perches of ground, would grow up into a great emporium. It is, therefore, not a matter of censure, that they have been almost silent in the narration of events. Objects before they become considerable, seldom attract much notice.

The growing importance of the State would seem to justify the opinion, that its history ought to be enlarged and better understood. Hitherto, very little attention has been paid to this subject. New Hampshire, Massachusetts, Connecticut, Vermont, Virginia, North Carolina, Kentucky and Tennessee possess valuable histories, which have been written since the revolution. The history of New-York by Mr. Smith, although a work of intrinsic merit, does not appear to be calculated for the present time. Great changes have occurred in our civil and political institutions since he wrote. Our independence has been established upon a broad and solid basis; our population, our improvements and our commerce have been astonishingly augmented. New counties, new towns and new cities have sprung up: roads have been opened: bridges made and canals constructed. A State becoming so celebrated for its extent, its fertility, its agriculture, its commerce, its opulence, its internal improvements and its population, ought to be better known.

The method we have adopted in the arrangement of this work has been to divide it into three volumes. These we have subdivided into chapters.

The first volume treats of the extent of the State, its mountains, hills, champaigns, plains, vales, valleys, marshes, rivers, creeks, lakes, seas, bays, springs, cataracts, and canals; its climate, winds, zoology, &c.

The second volume treats of the counties, cities, towns and villages; antiquities of the west; origin of the Agoneaseah, their manners, customs, laws and other matters; discovery of America; voyages of Cabot and Hudson; settlement of the New Netherlands by the Dutch, in 1614; location of the Indian tribes; controversies between the Dutch and English; surrender in 1664, and thence to 1750.

The third volume treats of the war between England and France for the conquest of Canada, the war of the revolution, and other matters which occurred, &c.

In describing objects, and other things appertaining to natural, statistical and civil history, we have endeavoured to confine ourselves to facts, and have, in general, laboured to avoid embellishments. History, whether natural, civil or statistical, is founded on facts. Embellishments may please the fancy; but after all, they tend very little to instruct the mind. In natural history, we have avoided the use of technical phrases, when they might perplex and mislead. In most cases, where we have used these terms, we have been careful to give explanations; and in general have dispensed with them, except in tables, where definitions are affixed. Deviations, in almost every instance, are accompanied with explanations, so that little or no inconvenience can arise on this score.

With respect to this work, it is little more than a compendium or abridged history of the State. Geology, botany, zoology, &c. present immense fields, which no single individual can explore: all that he can do is to contribute his mite: this is all that we have aspired at.

In our relations, we have laboured to arrive at the truth. Impartial truth has constantly been before us. We have restrained ourselves in sallies of the imagination, though we are

not an entire stranger to the power of such illusion over the generality of readers. But according to our views, history, whether natural, statistical, or civil, does not belong to the department of romance. We have endeavoured to describe objects and things as we have found them. This has been our uniform aim. To please all sorts of readers, we know is impossible. He who writes with such delusive expectations must be a stranger to mankind. Our desire has been rather to instruct than to please. Those, therefore, who are enraptured only with the relations of contending armies, great victories, rapid conquests, the rise, extension and fall of kingdoms and empires, and other splendid events that dazzle the eye, must have recourse to other works. Our history of New-York is a detail of natural, statistical and civil history. It is the history of a great State: a State that has risen in two hundred and fifteen years, from the smallest beginnings; not, however, by conquest, but by enterprise, industry and virtue, which are more praise-worthy and noble, than the bloody laurels of conquerors.

With respect to the style, we do not intend to offer an apology. The great object of language, the indulgent reader will remember, is to express our ideas clearly and intelligibly. Pompous diction is above our capacity. We have endeavoured to render our efforts useful to society. This has been our constant aim. Should we have attained this, our ends are accomplished: the good of our fellow beings, is the utmost of our wishes.

JAMES MACAULEY.

Herkimer, (N. Y.) March 16th, 1829.

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THE

HISTORY

OF THE

STATE OF NEW-YORK.

CHAPTER I.

SITUATION, EXTENT, AND SUPERFICES.

THE State of New-York is situated between thirty-nine degrees and forty-five minutes, and forty-five degrees of north latitude; and between five degrees and forty-seven minutes of west longitude; and two degrees and ten minutes of east longitude, from the meridian of the City of New-York. Its greatest length from east to west, exclusive of Long Island, is three hundred and eighteen miles; and its greatest breadth, from north to south, three hundred and six miles. The length and breadth vary exceedingly, the outlines of the State being very irregular. The length in the north and south, and the breadth in the west, are very inconsiderable. From a computation of the square miles in each county, we have estimated the State to contain 45,530 square miles, exclusive of water.

It is bounded on the east by Vermont, Massachusetts and Connecticut; on the south by the Atlantic Ocean, and the States of New Jersey and Pennsylvania; on the west by a part of the latter State, called the Triangle, and part of Lake Erie, and the river Niagara; on the northwest by Lake Ontario, and the river St. Lawrence, as far as latitude forty-five; and on the north by the Province of Lower Canada. On the west side of Hudson's river, from its mouth to the latitude of forty-one, lies the State of New Jersey.

ASPECT.

The State of New-York exhibits great diversity of aspect. In some parts, plains of great beauty and fertility extend as far as the eye can reach, irrigated by numerous and copious streams: in others, there are gently ascending hills and declining vales. Some tracts abound with picturesque and romantic prospects, such as rugged hills, lofty mountains, craggy rocks, deep vallies, narrow winding dells, headlong torrents, and abrupt cataracts. Every where bounteous nature presents us with new and varied scenes, which partake either of the beautiful, picturesque, or romantic kinds, with soils as varied as the scenes themselves. Sometimes she presents them all in the same view. We shall first describe the mountains, hills, champaigns, plains, vales and valleys, and afterwards attend to its rivers, creeks, lakes, ponds, seas, bays, falls, canals, &c.

MOUNTAINS.

There are two extensive tracts of mountainous countries in the State of New-York: the one is in the north, and the other is towards, and at the south, and along the borders of New England. They are in some measure separated by the valley of the Mohawk. Fall Hill, according to some, connects them, but the connection is very faint.

That in the north, which we have called the Sacondaga tract, commences in the Province of Lower Canada, a little north of latitude forty-five, and extends southwestwardly to the Mohawk river and its vicinity, and is upwards of one hundred and forty miles in length, and nearly one hundred and twenty-five in breadth, where broadest. Its breadth and length, however, vary greatly. At latitude forty-five, which is the line between this State and Lower Canada, it is not twenty miles broad, while at latitude forty-three and a-half, it exceeds one hundred miles. Its length also varies very much. We shall

endeavour to describe its exteriors; but from the uncultivated state of the country, we shall not be able to arrive at results so accurate as we could desire. On the east it is bounded by the hilly tracts of the county of Clinton and by Lake Champlain, and a line drawn from the head of South Bay, on that lake, striking the Hudson between Glen's Falls, and the Great Falls, on that river; on the south by the champaigns and plains of the county of Saratoga, and those of the county of Montgomery, westwardly to Anthony's Nose, which is the termination of Clip Hill, Mayfield mountain, or Clinton mountain, (as we have named it, in order to prevent confusion arising from so many unmeaning and whimsical names;) and thence westwardly in some respects by the valley of the Mohawk, and the hills of the county of Oneida, lying north of that river and Oneida lake; on the west and northwest by the hilly parts of the counties of Oswego, Lewis, and St. Lawrence; and on the north by the champaigns, or flat country of Lower Canada. It comprises all of the counties of Essex, Warren, and Hamilton, the northern parts of Washington, Saratoga, and Montgomery, the central and northern parts of the county of Herkimer, the northern part of the county of Oneida, the northeastern part of Oswego, a very small part of Jefferson, large portions of Lewis, St. Lawrence, Franklin, and Clinton, embracing eight or nine thousand square miles.

This tract is traversed from northeast to southwest, with the exception of the Highlands lying between Black river and the Mohawk river, and Oneida lake, by six principal chains of mountains, which range from northeast to southwest, besides their collaterals, bifurcations, &c.

These ranges or chains are not exactly continuous, like some of those belonging to the Alleghanies, and some other mountains; but consist of detached masses or links, running in lines parallel one with the other, often elevated, occasionally depressed, their surfaces displaying summits, sometimes regular, sometimes round topped, and now and then denticulated, pyramidal, saddle shaped, &c.

Besides the principal or main chains, and their ramifications,

there are multitudes of other mountains, of much less extent, scattered over the country, which appear either in solitary groups, or insulated masses. These in general have no determinate directions. Of these some have considerable elevation, frequently equalling the main chains; while others are low, being little else than heaps of rocks based on the general plain, which contains the leading ranges. These, as well as the main chains, display various phantastic forms; such, for instance, as segments, pyramids, domes, cones, and castles. Of the principal chains, the two central form the demarcation line between the waters of the Hudson, Sable, and Saranack, which flow on one side, from those of Black, Oswegatchie, Grass, Racket, St. Regis, Salmon, and Chateaugua rivers, which descend on the other side. The two central chains are from seven to fifteen or twenty miles asunder, and extend parallel nearly or quite to the Mohawk river. A multitude of lakes and ponds are disseminated between them. The sources of the Hudson and Racket, and some of their branches, are in lakes and ponds, lying in the most elevated parts between these chains.

They occupy an extent of forty or fifty miles in length, and from seven to twenty in breadth. From these chains the others decline, on the one hand, towards Lake Ontario and the St. Lawrence; and on the other, towards Lake Champlain and the basin proper of the Hudson. The whole tract, taken together, exhibits a depression on all sides, which is sometimes gradual and at others abrupt.

To be convinced of these facts, we have only to examine the topography of the country. By this we find that all the other rivers and streams derive their sources from less elevations.

The Schroon and Sacondaga rivers that fall into the Hudson, the East and West Canada creeks that fall into the Mohawk, the Mohawk itself that falls into the Hudson, Salmon and Black rivers that fall into Lake Ontario, the Oswegatchie, Grass, St. Regis, and Chateaugua that fall into the St. Lawrence, and the Chazy, Saranack, Sable and Boquet that fall into Lake Champlain, have their sources in places less elevated.

In describing the several ranges, we shall commence with the Palmertown on the southeast. This range rises on the western shore of Lake Champlain, in the neighbourhood of Ticonderoga, traverses the northern and northwestern parts of Washington, and the southeastern part of Warren, and then crosses the Hudson into the county of Saratoga, a short distance above Glen's Falls, and soon after sinks to the level of the flat country, in the vicinity of the highly noted Saratoga Springs. It presents an undulating surface, whose summit towers many hundred feet above the plain. Its length is between fifty and sixty miles, and its base is from three to seven miles broad. That part of the range lying between Lakes Champlain and George occupies the whole space between those lakes, forming with its base their shores. Its sides, in some places, are exceedingly steep, and in others very precipitous. Between Lakes Champlain and George it often exhibits bare rocky surfaces, and mural walls, of very savage aspect, and dreadful sterility. Its elevation varies considerably. In the north it is from 720 to 1,100 or 1,200 feet in height, and in the south, from 400 to 600.

On the east side of Lake Champlain, and opposite to the preceding, there is another range which deserves to be noticed, although it is not in this State. Its commencement is at or near Mount Independence, a little to the southeast of Ticonderoga It extends up the lake to near White Hall, where it bends away to the east, and soon thereafter degenerates into hills. This range, on the Champlain side, is scarcely less rugged and barren than the Palmertown. The narrow bed of Lake Champlain separates these mountain ranges. In some places their bases are hardly a stone's throw apart.

The Kayaderosseras range lies from four to seven, or eight miles northwest of the Palmertown range. It also commences on the western shore of Lake Champlain, but farther to the north, and extends southwestwardly into the eastern part of the county of Montgomery, where it gradually subsides. It crosses the southeasterly part of Essex, passes through the easterly part of Warren, and across Saratoga, crossing the Hudson and Sacondaga rivers, a little above their junction. Its termination

is in the town of Broadalbin, eleven or twelve miles north of the Mohawk. The base of this mountain is broader than that of the Palmertown, and its elevation proportionably greater. Between Lake George and Schroon river, which flows northwest of it, its height is estimated at from 800 to 1,200 feet; in Saratoga it is deemed to be from 500 to 700 feet. The Kayaderosseras often rises very abruptly. Its summit is in general quite irregular and much broken. The length of this mountain range is upwards of seventy miles. Like the Palmertown range it frequently exhibits bare rocks, frightful precipices, and great sterility.

The next range we have designated the Clinton range, in honor of De Witt Clinton, the late Governor of the State. This range begins, like the preceding, on the western shore of Lake Champlain, in the northeastern corner of the county of Essex, and runs southwestwardly to the Mohawk river, where it ends at a place called Anthony's Nose, by an abrupt descent. Its length is nearly or quite one hundred and twenty miles. In Essex it is called the Giant of the Valley; in Montgomery, Mayfield Mountain, Clip Hill, &c. It traverses the middle parts of Essex in an oblique direction, the westerly part of Warren, the southeasterly part of Hamilton, and after entering Montgomery, runs diagonally through two-thirds of its central parts. In the county of Essex, about a mile west of the court house, it presents an almost perpendicular front of 1,200 feet above the surface of Lake Champlain, or upwards of 1,300 feet above the level of the ocean. More southerly it is still higher. Its elevation, in the towns of Mayfield and Johnstown, is from 900 to 1,100 feet. It is lower at and near the Mohawk. For the last ten miles of its course it has only one declivity, and that is to the southeast.

The range denominated the Sable, has its origin in the county of Clinton, fifteen or twenty miles west of Lake Champlain, and takes a southwesterly course across the westerly part of Essex, the southeasterly part of Hamilton, and after entering the county of Montgomery, terminates westwardly of the Clinton range, some miles north of the Mohawk. Its length does not differ

much from one hundred and thirty miles. Its summit, like the foregoing, is irregular and broken. In the town of Wilmington, in the county of Essex, one of its peaks, called White Face, rises to the height of 2,600 feet. This range, taken together, is much more elevated than the ranges before noticed. By some it is called Peru, and by others Sable. To prevent confusion, we have given the whole range the latter designation.

The Chateaugua range, which is the longest and highest, commences in the Province of Lower Canada, a little north of latitude forty-five, and pursues a southwesterly course to the Mohawk river, which it crosses at Little Falls, in the county of Herkimer, and soon after becomes lost in the Osquake Hill. It is upwards of one hundred and forty miles in length. In its course, after it has entered this State, it runs through the northwestern part of Clinton, the southeastern and northwestern parts of Franklin and Essex respectively, and thence through Hamilton, dividing it into two nearly equal parts, and then penetrates the county of Herkimer, where it subsides, or is arrested as before stated. The Chazy and Sable pass through it. The Chateaugua mountains or hills, as they are called in the north, rise with considerable abruptness from the flat country of Lower Canada, and soon attain an altitude of 1,000 or 1,200 feet above the ocean. About sixteen miles south of latitude forty-five, they are still higher. Chateaugua lake, which is on these mountains, is about 1,400 feet higher than the ocean. The summit of the range under consideration, however, rises far above the lake. In Hamilton it rises still higher, the most elevated parts being in this county. Thence, southwesterly it declines gradually, so that at Little Falls it is only 712 feet. For several miles before it reaches the latter place, its summit rises but little above the level of the country through which it passes.

We think we hazard nothing in saying that the country at the base of this mountain, in the county of Hamilton, is from 1,800 to 2,000 feet above the level of the ocean. The extreme sources of West Canada creek and Black river, which are not so high, have elevations of 1,500 or 1,600 feet. We shall have

occasion hereafter to remark, that the summit level at Remsen, between Black river and the Erie canal, at Herkimer, is 840 feet above the latter. Now the Erie canal, at this place, is 380 feet above tide water on the Hudson, which would give an actual elevation to the summit, in Remsen, of 1,220. From this summit, the country rises all the way to the sources of those streams, which are from twenty-five to thirty miles. The ascent does not fall short of ten or twelve feet, upon the average, to the mile, which would give the proposed elevation.

There is another range, lying from nine to fifteen miles northwesterly of the Chateaugua, but it has much less extent. The St. Regis, Racket, Grass, &c. which descend into the St. Lawrence and Lake Ontario, pass through it.

West of the latter range are other mountains, which spread over the country as far as the county of Jefferson. There are some also on the side of the St. Lawrence. Most of the streams that fall into Black river, between Wilna and where it diverges from West Canada creek, are bounded by mountains and hills that descend towards that river.

There are two other ranges, which are connected with the foregoing mountains, that we shall briefly notice. The first is denominated the Highlands of Black river. It extends from near the sources of Black creek, a water of West Canada creek, westwardly and northwestwardly about sixty miles, and occupies, in a measure, the country situated between Black river on one side, and Hassencleaver mountain, and the flat and hilly country lying northerly of Oneida lake on the other. Its breadth, at its base, is from eight to twenty miles. West Canada creek, in its way to the Mohawk, descends its southern declivity. The Mohawk, Fish creek, Salmon river, Sandy creek, and Deer creek rise in it. Branches accompany all these streams. The altitude of the Highlands of Black river may be set down at from 1,220 to 1,600 feet above the ocean. At Remsen, between Trenton Falls and Black river, the summit level between the waters of that river and the Mohawk, at Herkimer, is 840 feet. In 1825, the Hon. James Geddes, one of the canal engineers, took the levels between the Erie canal and Black river, and found the summit

to be elevated as above stated. Tug Hill, which crosses the West Canada creek, a little above Trenton Falls, is 300 feet, or more, higher than the level taken by Mr. Geddes. The summit of the Highlands often exhibits a rolling surface of three, four, or more miles, in breadth.

Hassencleaver, in the counties of Herkimer and Oneida, the other range, is about twenty miles in length. It occupies the space between the Highlands and Mohawk river. West Canada creek, after it has descended the Highlands, runs some distance along its back, at its base, and then passes by its termination on the east, and soon after reaches the valley of the Mohawk. Hassencleaver is eight or nine miles broad at its base, and has an elevation of from 800 to 1,200 feet above the ocean. Its declivities present rolling surfaces. The road from Utica to Trenton, and Martinsburgh, passes over it. There is a fine view of this mountain from Tug Hill, a mile above Trenton Falls—also, from the hills south of the Mohawk river. The highest part, according to an admeasurment made by the Hon. Benjamin Wright, one of the canal engineers, is in the county of Herkimer, opposite to the mouth of Staring's creek, in the town of Schuyler.

The mountainous tract towards, and at the south, and along the borders of New England, comprehends most of the counties of Putnam, Rockland, Orange, Ulster, Sullivan, Delaware, Schoharie, Broome, Tioga and Stuben; the southerly parts of Alleghany and Chenango, the southerly and easterly parts of Otsego, the southwesterly part of Albany, the westerly and southerly parts of Greene, the easterly parts of Westchester, Dutchess, Columbia, Rensellaer and Washington. It is upwards of 250 miles in length, measuring from the eastern bounds of Putnam, to the western bounds of Alleghany; the line is northwest and west, according to the form of this part of the State. Its extent, along the New England border, exceeds one hundred and seventy miles. At the Hudson the breadth is about twenty miles. On going about twenty miles west of that river, the width is eighty miles; thence proceeding westwardly, the breadth dimi-

nishes to fifty, and so down to twenty miles. The entire superfices in square miles, do not differ much from 12,000.

The mountain ranges and groups, comprised in this tract, have various appellations: those on the east are called Peterborough, Williamstown, Taconic, &c. Those at the Hudson are called the Highlands, or Matteawan mountains. Those more west are denominated the Kaatskill, Shawangunk, Blue, Tioga, &c. We shall describe the principal ranges, &c. beginning with the Taconic.

The Taconic enters this State from Vermont, in the northeastern corner of the county of Rensellaer, and pursues a southerly course, being partly in this State and partly in Massachusetts, to the southeasterly corner of Columbia county, a distance of fifty miles, where it separates into two ranges. The one continues southerly through the eastern parts of Dutchess, Putnam and Westchester, and terminates not far from Kingsbridge, on Harlem river: the other winds away in a southwesterly direction to the Hudson, crossing the county of Dutchess obliquely. In the north the Taconic is called the Williamstown mountain. On the west side of this mountain there is a valley extending from the northeasterly corner of Rensellaer, to the county of Dutchess, on the south. It has Peterborough mountain on the west. This valley comprises the valley of Little Hoosac, the vale of Lebanon, &c. In Sheffield, Massachusetts, the Taconic rises to the height of 3,000 feet.

Peterborough mountain lies west of the Taconic. It enters the county of Rensellaer from the southeastern part of the county of Washington, and advances southerly and parallel with the Taconic, to the northern part of Dutchess county, where it also winds away to the Hudson. It passes the river north of the Highlands, and penetrates the county of Orange. Its elevation is less than that of the Taconic, and its outlines more regular. In some places it descends to the level of the country. It is called Bald, as well as Peterborough, in Rensellaer. A beautiful valley intervenes between these mountains.

The Highlands, or Matteawan mountains, traverse the county of Putnam, and parts of Dutchess and Westchester, on the

east side of the Hudson, and portions of Orange and Rockland, on the west side of that river. They cross the Hudson at West Point, &c. and extend from New England, on the northeast, to New Jersey, on the southwest, their course being oblique across the State. These mountains unite the Alleghanies with those of New England. They have a breadth of eighteen or twenty miles at the Hudson, and consist of several ridges runing parallel one with the other. After crossing the Hudson they become broader on account of other ridges rising and holding corresponding courses. The scenery, where the Hudson passes through them, is exceedingly grand. The Highlands have greater elevation before they reach, and after they leave the river, than they have at the river.

The Shawangunk, which lies northwesterly of the Highlands, is a continuation of Blue ridge, one of the chains of the Alleghanies. It enters this State from the northwest corner of New Jersey, and proceeds to near the union of Rundout and Wall-kill rivers, where it degenerates into hills, which seem to be lengthened out northerly to the Kaatskill mountains. The Shawangunk crosses the westerly part of the county of Orange, and the southeasterly part of the county of Sullivan, after which it penetrates some distance into Ulster county. Its extent, in this State, is about forty-five miles, and its general direction northeast. The Hudson and Delaware canal runs on the northwest side, at and near the base. Its base, in some places, is six or seven miles broad. It has considerable elevation, and a pretty uniform summit. The Shawangunk is connected with the Kaatskill mountains, by a series of irregular hills, which range across Ulster, a few miles west of Kingston. The Rundout, Esopus, and Platt flow through them. They rise at one time 2 or 300 feet, and sink at another, to the level of the country. On the confines of Greene, they assume a loftier character, and speedily rise into mountains.

The Blue mountains advance into this State from Pennsylvania. They lie northwest of the Shawangunk. They range at first northeasterly, and then northerly, uniting with the Kaatskill on the northern borders of the county of Ulster. In the latter

county they are between twenty and thirty miles west of the Hudson. They, at first, upon entering Ulster, are about twenty miles distant from the Hudson, and approach it at an angle of about thirty-five degrees; they, however, soon recede, and at about the same angle. As they approach that river, they fall, and as they recede, they rise.

Between the Blue and Shawangunk mountains there is an extensive valley. The Hudson and Delaware canal runs many miles in this valley. The Blue mountains are more elevated and broken than the Shawangunk. These mountains are seen, to good advantage, from the tranquil waters of the Hudson, in a fine day. Their azure hue has conferred on them the name they bear. In the State of Pennsylvania these mountains are called the Kittatinney. Their elevation often exceeds 2,000 feet.

The Kaatskill mountains may be said to rise near a place in the county of Ulster, called Saugerties, eight or nine miles west of Hudson's river. The grand ridge stretches in a northwesterly direction, to the southeasterly part of the county of Otsego, passing through the southwesterly parts of Greene, and Schoharie, and the northeasterly part of Delaware, keeping on and near the bounderies of the latter counties. It divides the waters of Schoharie creek, from those of Esopus creek, Papachton and Delaware rivers.

In the county of Greene, the Grand ridge detaches a branch that extends on the right bank of Schoharie creek to the county of Montgomery, where it recedes, and soon after ends at the Mohawk, in what is called Flint Hill. This ridge declines all the way from its commencement to its termination. The western declivity, as far as Schoharie court-house, is usually short and rapid. The eastern is in general longer and more gradual. The Heldeberg, in the county of Albany, is a spur of the preceding branch.

The Kaatskill mountains are the loftiest in the State, and have a majestic appearence when viewed from the placid waters of the Hudson.

The following are the highest altitudes:—first, Pine Orchard has an altitude above the tide waters of the Hudson, of 3,000

feet—second, High Peak has one of 3,718 feet—third, Round Top has one of 3,804 feet. These are in the county of Greene. In Delaware and Schoharie, the Grand ridge may be put down at from 2,000 to 2,600 feet. The branch which accompanies the right bank of Schoharie creek, is 1,153 feet high at the source of Catskill creek. The Heldeberg is from 400 to 600 feet. Flint Hill, in the county of Schenectady, is probably 800 feet. The latter branch we have named Kanjearagore, which seems to have been the Agoneasean designation of the Kaatskill mountains. *See colonial laws as to the name.*

MOUNTAINS ALONG THE DELAWARE, &c.

Two chains of mountains, which terminate in the Grand ridge of the Kaatskill, accompany the Papachton, a branch of the Delaware. They are from 500 to 1,000 feet above the river, and from 1,800 to 2,600 above the ocean. That on the right bank occupies the space to the Delaware, and constitutes the eastern outline of its valley. Between the Delaware and Susquehannah rivers there is one principal chain, which rises on the confines of Montgomery county, in the town of Springfield, county of Otsego. This chain runs southerly, on the east side of Otsego lake, and after passing Charlotte river, is joined by a branch from the borders of the county of Schoharie. It then takes a southwesterly course. Its elevation is from 1,500 to 2,300 feet above the ocean. The hills along Cherry Valley and Sheneva creeks, and other streams, pass into it. The chain on the right bank of the Susquehannah begins in the town of Warren, in the southern part of Herkimer, at or near the great western road, and runs southwardly along the west side of Otsego lake and the Susquehannah, to Charlotte river, where it also turns off to the southwest. Its elevation is from 1,400 to 1,900 feet. The outlines of this chain have more smoothness than the foregoing. On the west side of Otsego lake, it exhibits series of beautifully rolling hills joined towards their bases. Otego creek and Unadilla river run between

hills which aspire to the character of mountains. These hills unite with the mountain chain on the right bank of the Susquehannah. The chain between Unadilla and Chenango rivers, is from 1,200 to 1,700 feet in elevation, above the ocean. The chain on the west side of Chenango is nearly as elevated. Between the last chain and the Cayuta creek, the country is hilly, except near the border of the State.

The counties of Broome, Tioga and Stuben are considerably broken by mountains. There are two principal groups. The one is in Broome, the other in Tioga and Stuben. Both belong to the Alleghanies, and are connected with those of Delaware, Otsego and Chenango. Some of them are very rugged and barren, while others have smoothness and much cultivable lands.

The mountain and hill ranges of Delaware, Otsego, Chenango, &c. are based upon a highly elevated and inclined plain, which has two principal declivities; the one towards the Mohawk and the lakes, and the other in the direction that the waters of the Delaware, Susquehannah and Alleghany rivers flow. The spine of this plain commences near the source of the main branch of the Delaware river, and runs north northwesterly upon the confines of the counties of Schoharie and Otsego, to the borders of Montgomery county, where it changes its course and runs westerly, to the northwesterly corner of the county of Chenango. Here it turns and runs southwesterly, passing by the heads of Cayuga and Seneca lakes. It then pursues a west northwesterly course, till it has gone by the head of the Conhocton, after which, its direction, in the main, is westwardly to Portland, in Chatauqua county, on the shores of Lake Erie. Most of the mountain and hill ranges commence on the summit of this spine, and in general take opposite directions. These ranges often appear to gain elevation as they recede from the spine, but this is usually in consequence of the valleys deepening. The valleys of Delaware, Susquehannah, Unadilla, Chenango, &c. become deeper, and the mountains and hills higher; that is, the mountains and hills gain in elevation what the plain on which they stand looses by declination. All the ridges which take their departure in the direction of the Mohawk and

lakes, are inconsiderable as to length. The ridges between Sauquait and Oriskinny, between the latter and Oneida creek, &c. may be cited as examples. On the southern declivity, however, the ridges have great length, often stretching far beyond the State. The river valleys have also great extent. The valley of the Chenango is almost co-extensive with the river, so is that of Unadilla.

Louslersberg, four or five miles west of Athens, in the county of Greene, is 322 feet above the tide water of the Hudson. The foot of Kaatskill mountain, ten miles more to the west, is 867 feet above tide. The mountain itself, where Messrs. Hammond and Pitcher, the road commissioners, took the altitude, is 1,912 feet. This is the chain on the right bank of the Schoharie creek. Its rise from its base is 1,045 feet. The bed of the creek is about 700 feet above tide water.

Lake Utsayantho, (pond) which is the source of Delaware river, has an elevation of 1,886 feet above the Hudson. The mountains which nearly environ it, are 600 or 700 feet higher, which would give altitudes of 2,500 or 2,600 feet. The grand, or main ridge of the Kaatskill passes by the pond on the north, at the distance of half a mile, being between the pond and Schoharie creek. The latter detaches a branch which accompanies the left bank of the Delaware.

The village of Delhi, twenty miles southwest of Utsayantho, is 1,380 feet above tide water. The descent of the Delaware, in this short distance, is 506 feet.

Between Delhi and the Susquehannah river, the land rises to the height of 2,143 feet above tide. The rise from the valley of the Delaware, in which Delhi is situated, in going westwardly four miles and a half, is 757 feet. In some places to the north, the rise between Delaware and Susquehannah rivers is still greater.

The Susquehannah and Unadilla rivers, at their union, are 1,000 feet higher than the Hudson. The highest point of land between Unadilla and Chenango rivers, setting out from the former, is 1,629 feet above tide. The ascent from the former is 716 feet, and the descent to the latter 669. The hill along

the east side of the Chenango is frequently rapid. The distance from the Unadilla to Oxford, on the Chenango, is fifteen miles.

The hill on the west side of Owego creek, is 1,379 feet above tide water. The valley along the creek, is only 1,104; consequently the hill is only 275 feet above the bottom of the valley. Between Cayuga and Seneca lakes, the land is usually 1,256 above the tide water of the Hudson. In some instances the lands around the heads of these lakes are 1,600 feet above the ocean.

The elevation between Seneca lake and Mud creek, of Conhocton river, is from 1,482 to 1,600 feet. There is a ridge of hills between the latter creek and Conhocton, which is 1,580 feet above tide water. The ascent on the side of Mud creek is 462 feet, and from Bath, on the Conhocton, 465 feet. The actual elevation above the general surface of the country hereabouts, is, at most, only from 465 to 500 feet.

The heighth of land between the rivers Conhocton and Genesee, where the waters approximate, is 1,840 feet above tide water—say 1,850 above the ocean. The aspect of the country is moderately rolling.

The space between the head waters of the Canisteo and Black creek of Genesee river, is 2,062 feet above tide, and 862 feet above Ark Port, on the former river; and 634 feet above Angellica, on the latter river. Thus much for one line, so far. We shall return again to the vicinity of the Hudson, and take up another line, which is more to the south.

Palmer mountain, near the line between the towns of Middletown and Andes, in the county of Delaware, has an elevation above the tide waters of the Hudson, at Kingston, in the county of Ulster, of 2,111 feet. Pine mountain, where it divides the counties of Ulster and Delaware, is 1,780 feet above tide water. Its elevation in other parts of its course, is occasionally 2,000 feet. The Shawangunk mountain is from 1,866 to 2,000 feet high, east of Mamakating, in the county of Sullivan. The lime-stone ridge, or hills lying westwardly of Kingston, in the county of Ulster, is 217 feet above the Hudson. Between the river and the ridge the country is a plain. Hunk Hill, near Wawarsing, in Ulster county, is 605 feet above tide, and 294

above the creek, at the same place. The ridge between Chesnut creek and Beaver kill is 1,063 feet higher, or 1,668 feet above tide water. The descent from this ridge by Beaver kill, to Neversink river, is 353 feet. Beyond the Neversink the hill rises 417 feet, which gives an elevation above tide water of 1,725 feet. Mongaup Gap is 768 feet above the Neversink, and 2,080 feet above tide water. The Gap is about forty miles west of the Hudson in a direct line. The course of this mountain is northerly and southerly. The bed of the river Delaware, one mile above the mouth of the Papachton, is 915 feet above the level of the tide water on Hudson's river. The descent of the Delaware, from Delhi to this place, is 465 feet.

From the Willeweemack, to the junction of Delaware and Papachton rivers, the streams are bounded on each side by mountains, from 500 to 1,000 feet in perpendicular height, computing from the beds of the streams, which may be considered nearly on a level with the floor of the country.

The elevation above the tide water of the Hudson, between Deposite, on Delaware river, and Windsor, in the county of Broome, on the Susquehannah, is 1,689 feet. The bed of the Delaware, at Deposite, is 992 feet above tide; and that of the Susquehannah, at Windsor, 913 feet, the mountain, therefore, is only 697 feet. From Kingston, in Ulster county, to Bath, on the Conhocton, in Steuben county, the distance is two hundred and thirteen miles.

The Chautauqua ridge, near Cosdaga outlet, in the county of Chautauqua, is 1,146 feet above the surface of Lake Erie, and 1,720 above the ocean. Between Cosdaga flats and Clear creek, the same ridge is 1,398 feet above Lake Erie, and 1,972 above the ocean. The height of land between Elm and Little valley creeks, in the county of Cattaraugus, is 1,153 feet higher than Lake Erie, and about 1,725 higher than the ocean. The land between Little and Big valley creeks, in the same county, is 1,563 feet above Lake Erie, and 2,138 above the ocean. The elevation between Big valley and Ichua creeks, in the latter county, is about the same. At Franklinville the land is 1,580 feet above the level of the ocean. Angellica, in

the county of Alleghaney, on the east side of Genesee river, is 1,434 feet above the ocean. In Rushford and Centerville, in the western part of the county, near some of the head waters of one branch of Cattaraugus creek, the elevation above the ocean is 2,163 feet. The Chautauqua ridge varies from 1,573 to 2,163 feet above the ocean. The lands more to the south, especially in Alleghaney and Cattaraugus counties, are higher, being from 1,600 to 2,300 feet above the ocean. In a few places some of the hills may be still higher. The country, it is well known, rises towards the sources of Alleghaney and Genesee rivers; but these are in the State of Pennsylvania.

In relation to most of the elevations between Athens, Kingston and Newberg, on the Hudson, and Portland, on Lake Erie, we are indebted to Jabez D. Hammond, Esq. late a senator; and Joshua Pitcher, Esq. at present Lieutenant Governor of this State. These gentlemen were appointed commissioners in 1826, to explore a rout for a road from the Hudson to Lake Erie. *See their report. It is a valuable document.*

Summit pond, at the very head waters of the Susquehannah, in the northerly part of the county of Otsego, is 1,346 feet above tide water on the Hudson. This pond is on the height of land between Otsego lake and the Mohawk river. Its waters in the spring, flow into the latter as well as the former. The Susquehannah valley, after it has passed Otsego lake, spreads out like a fan; the distance from hill to hill on the turnpike, being seven miles. The aspect is gently waved. The general direction of the swells is towards the lake. From Summit pond to the lake, the descent is 158 feet, and from the lake to the Pennsylvania line, 292. The depression of the valley then, from Summit pond to the line, is 450 feet. The hills or mountains, as they are called, more to the south, are from 1,400 to 2,300 feet above the ocean. In certain places they may be some higher. We have estimated them at and near the great road, at from 1,400 to 1,500 feet. We have already remarked, that the chain on the east side of the valley, is 2,143 feet high, four and a-half miles west of Delhi, and between Deposite and Windsor, 1,689. The valley in which the

village of Cherry Valley is situated, a mile northerly of the village, is about 1,360 feet above the tide water of the Hudson. The hill on the west side of the valley, we have described as bounding the east side of the Susquehannah valley. That on the east side is a branch of the former. About three miles eastwardly of the village, there is another hill forming the southeasterly side of another valley. This hill is also a branch of that first above specified. The three latter hills end on the north, at the declivity of the Osquake. The Osquake hill is a portion of the spine, stretching from near the sources of Delaware river to Lake Erie. All the leading hills of Otsego have their commencement at or near the Osquake hill. The descent from the Osquake hill to the Mohawk river, is from 800 to 1,000 feet; and in the distance of from five to eight miles. In some places the descent is rapid. The descent from the same hill to Schoharie creek, by the state road, in eighteen miles, is about 800 feet. Besides several short steep offsets, and some long slopes, there is an almost continued descent.

Lake Utsayantho, out of which Delaware river issues, and which is situated at the head of the valley, is 1,886 feet above tide water; and the bed of the river at Deposite, 992 feet. The mountain, on the southeast side of the valley, varies from 1,700 to 2,300 feet above tide. That on the northwest side is nearly as high.

The hill between Chenango and Unadilla rivers, is from 1,600 to 1,800 feet above tide water; and that west of the former river is almost of similar elevation. The mouth of the Chenango is 823 feet higher than tide water; and the summit level at the head of the valley, where the proposed canal is to pass, is 1,126. The hills along the Chenango may be estimated at from 1,300 to 1,800 feet above the surface of the ocean. They are lowest in the north. That part of the plain on which they are based, is lower than that on which those of the Susquehannah are based; as that again is lower than that on which those of the Delaware stand. We have alredy seen that the elevation of the spine is 1,886 feet at Utsayantho; 1,360 a little north of Cherry Valley, 1,346 at Summit Pond,

1,126 at the pass from the Chenago to the Orskinney, on the line of the contemplated canal. At Deposite the plain is 992 feet; at the union of Susquehannah and Unadilla rivers 1,000, at the mouth of the Chenango 823, and at the mouth of Owego 783 feet.

We shall conclude with some general observations, and by giving tables of elevations.

All the mountains of the State of New-York may be considered as belonging to the Alleghanian or Appalachian mountains. The length of these mountains is about one thousand miles, and their breadth from twenty to one hundred and fifty miles. They extend from the mouth of the St. Lawrence, in the Province of Lower Canada, in a southwesterly direction, to the Mississippi, above Natchez, where they end in bluffs and rocky steeps. In the north they run near the Atlantic coast, till they have passed the Hudson, after which they recede. In New England and New York some branches shoot off, and terminate on the borders of the ocean and Long Island Sound. The Alleghanies traverse New England, New York, New Jersey, Pennsylvania, Maryland, Virginia, North Carolina, Kentucky and Tennesee. They divide the waters, generally speaking, which fall into the Atlantic Ocean, from those that fall into the St. Lawrence and Mississippi rivers. In New England they are called the White mountains, Green mountains, &c. The Sacondaga mountains are joined to the Green mountains by the chain extending from Mount Independence, to East Bay, &c. near White Hall; and the Kaatskill, by the Blue, and others, to the Alleghanies of Pennsylvania.

TABLE OF ELEVATIONS.

1*st. Sacondaga Mountains.*

1	The Palmertown range, from	. . .	500 to 1,200	feet
2	— Kayaderasseras	" . . .	700 to 1,200	do.
3	— Clinton	" . . .	600 to 2,000	do.
4	— Sable	" . . .	700 to 2,600	do.

5	The Chateaugua, estimated from	. .	712	to 3,000	Ft.
6	— Range lying N. W.	" . .	1200	to 2,000	do.
7	— Highlands of Black river	" . .	1220	to 1,600	do.
8	— Hassencleaver	" . .	800	to 1,200	do.

2*d*, *The Highlands*, &c.

1	Anthony's Nose	935	Ft.
2	Bear Mount	1,350	do.
3	Crow Nest	1,418	do.
4	Butter Hill	1,529	do.
5	New Beacon	1,528	do.
6	Sugar Loaf	886	do.
7	Bull Hill	1,484	do.
8	Break Neck	1,187	do.
9	Old Beacon	1,471	do.
10	Fort Putnam	786	do.
11	Hook Mountain	1,000	do.
12	Taconic (Sheffield, Massachusetts,)	3,000	do.
13	Peterborough, or Bald		

Note.—The Highlands have been measured by Captain Alden Patridge, President of the Military Acadamy, at Middletown, Conn.

3*d*, *The Kaatskill Mountains*, &c.

1	Pine Orchard	3,000	Ft.
2	High Peak	3,718	do.
3	Round Top	3,804	do.
4	The range on the right bank of Schoharie, westwardly of Athens on the Hudson . .	1,912	do.
5	Shawangunk and Blue Mountains.	2,000	do.
6	Palmer Mountain, in Delaware county . . .	2,111	do.
7	Pine Mountain between Delaware and Ulster counties	1,780	do.
8	The ridge between Chesnut Cr. and Beaver kill	1,668	do.

9 Mongaup (in Sullivan county)	2,080	Ft.
10 Helderberg	600 to 700	do.

4th, Other Elevations.

1 Mountain ranges along Papachton river, from	1,600 to 2,600	Ft.
2 Lake Utsayantho	1,886	do.
3 The range between Delaware and Susquehannah rivers, from . . .	1,500 to 2,300	do.
4 The range between Unadilla and Chenango rivers	1,200 to 1,700	do.
5 Chautauqua ridge, from	1,573 to 2,163	do.
6 Sources of Genesee and Alleghany rivers, estimated at	2,300	do.

5th, Summit Levels, &c.

Summit Pond in Otsego county	1,346	Ft.
Otsego Lake about	1,188	do.
Summit of the Chenango, proposed canal . . .	1,126	do.
Hills around the head of Cayuga lake, from	1,250 to 1,380	do.
Hills around the Seneca Lake, from . .	1,300 to 1,380	do.
Rome Summit level	420	do.
Oneida Lake	360	do.
Onondaga Lake	350	do.
Montezuma (canal level)	371	do.
Cayuga Lake, estimated at	371	do.
Seneca Lake	431	do.
Crooked Lake	700	do.
Canandaigua	680	do.
Lake Ontario	230	do.
Lake Erie	565	do.
Owasco, in Cayuga county, estimated at . . .	685	do.
Skaneatelis, in Onondaga county	834	do.
Lewistown Heights (Niagara county)	576	do.
Ontario Heights near Lock Port	600	do.

Lock Port at the foot of the Steep (canal) . . .	504 Ft.
Aqueduct at Rochester	501 do.
Lake Champlain	086 do.
Summit Level of the Champlain canal	140 do.
Lake George	243 do.
Linklaen's lake (the Hawgena of the Agoneaseah) estimated at	800 do.
Chautauqua lake	1,560 do.

CHAPTER II.

HILLY TRACTS.

THE hilly tracts comprehend the greater parts of the counties of Washington, Rensellaer, Columbia, Dutchess, and Westchester, lying on the east side of the Hudson; parts of Ulster, Greene, Albany and Schenectady, lying on the west side of that river; the southerly parts of the county of Montgomery, or those portions on the south side of the Mohawk, and west of Clip hill, or Clinton mountain, and back from the river to the forest, eight or ten miles; the northern parts of the counties of Schoharie and Otsego; the southerly part of the county of Herkimer, that is most lying south of Tug Hill, comprising over one-fourth of the whole territory, excepting, however, most of the towns of Manheim, Warren, Columbia and Hassencleaver mountain; the southern part of Oneida, and some portions of the centre; nearly all the counties of Chenango and Madison; the southern and middle parts of Onondaga; the southeasterly part of the county of Cayuga; portions of Courtland; the greater part of the counties of Tompkins and Yates; portions of Tioga and Steuben, adjoining those counties; the southerly and westerly parts of Ontario; portions of Livingston, Alleghaney and Cattaraugus; the northeasterly part of Oswego; some portions of Jefferson, bordering on Lewis; that part of Lewis adjacent to Black river, and southwestardly of that river to the Highlands; those parts of St. Lawrence and Franklin, contiguous to the Sacondaga mountains; and the interior part of Clinton. Such are the general outlines of the tracts denominated hilly. In most of these tracts there are champaigns, plains, vales, &c. of more or less extent, which are to be excepted. Some of these will be noticed in other parts of this work, under their proper heads.

The hilly tract along the Hudson, and its vicinity, is naturally divided into three parts; two of these are on the east, and one on the west side of that river. The first contains that part of the county of Westchester, situated westwardly of Taconic mountain, and on the borders of Long Island Sound. It descends westwardly to the Hudson, and southeastwardly to the sound. The surface along the river is agreeably diversified, but as you approach the Taconic it assumes asperity.

The second contains those parts of Dutchess, Columbia and Rensellear, situated north of the Highlands, and west of Peterborough, or Bald mountain, and nearly all of Washington, south of the head of Lake Champlain, and a line drawn from South Bay, to Fort Ann, and thence southerly to the Hudson below Fort Edward. Its surface, except in the neighbourhood of Lake Champlain, declines towards the Hudson. On the borders of Vermont, the hills are elevated and rugged, occasionally putting on the mountain character. The hills lessen all the way to the Hudson. They often exhibit beautiful surfaces.

The third contains the interior of Greene, the southwesterly and westerly parts of the county of Albany, and the westerly part of the county of Schenectady. Some portions of the county of Ulster, lying a little back from the river, may also be included in this tract. The whole has a declination towards the plains and champaigns bordering the river. On the borders of the Kaatskills, the hills are lofty and steep. The form of this tract is very irregular.

The next tract, and the principal one for extent, beauty and fertility, contains the hilly parts of Montgomery, Schoharie, Otsego, Herkimer, Oneida, Chenango, Madison, Onondaga, Courtland, Cayuga, Tompkins, Tioga, Steuben, Yates, Ontario, Livingston, Alleghany and Cattaraugus. Its length is about two hundred and thirty miles; and its breadth, which is variable, is from ten to forty miles. Its limits, on the east, are the hills of Schenectady and Albany; on the south, the Kaatskill and Alleghany mountains, and their continuations on the west, the plains of Cattaraugus, and on the north

the flat country champaigns, Oneida and Seneca vale, Sacondaga mountains, &c.

In Montgomery the hills slope towards the Mohawk river, and Schoharie creek. These streams flow in deep ravines, the country rising on either side from them with considerable abruptness. The hills of Schoharie descend towards the stream of that name, and sometimes end in perpendicular descents. The hills of Montgomery and Schoharie are mostly susceptible of tillage. The hills of Otsego and Chenango rise from the banks of the many rivers and streams which water those counties, and are disposed in ridges which have directions conformable to the streams. They rise in the south, and fall in the north, ending as it were on the spine, dividing the waters of the Susquehannah from those of the Mohawk and Oswego rivers, or else they descend the spine, and subside on the borders of the Oneida and Seneca vale, and the champaigns adjoining it. The hills of Chenango and Otsego may be regarded as continuations of the Alleghany mountains. The hilly parts of Oneida are mostly south of the road leading from Utica to Buffalo. The hills run along Sauquait, Oriskinny and Oneida creeks ; and between those streams, and are connected with those of Madison, as those are again with those of Chenango. The hills have considerable height, occasionally affording extensive views. From the hill, west of Oriskinny creek, Oneida lake, and the country around it, and the Highlands of Black river, appear in full view in a clear day. The soil of this tract is commonly rich.

The hills of Madison, Onondaga, Courtland and Cayuga are less rugged than those of Schoharie, Otsego and Courtland. In general, except along Chitteningo, Butternut, Onondaga and Otisco creeks, the country displays a pleasingly diversified aspect of hills and valleys. The soils, though variable, are among the best in the State. It is well watered by Oneida, Chitteningo, Limestone, Onondaga and Otisco creeks, which fall into Oneida lake and Seneca river, and by the head waters of Chenango. The Chitteningo, Onondaga and Otisco creeks flow in deep ravines. The hills bounding these ravines are high and steep, and at times craggy.

The hills of Tioga, Tompkins, Steuben, Alleghany and Cattaraugus may be deemed prolongations of the Alleghanies. In some places they are high and broken, and in others low, smooth and connected. The soils, in some instances, are good and in others middling or poor. The hilly parts of Tioga and Steuben, and a portion of the hilly part of Tompkins, are watered by branches of the Susquehannah, along which are many pleasant valleys. In Alleghany and Cattaraugus counties, the hills on the borders of Pennsylvania are sharp and rocky. These hills are traversed by the Genesee and Alleghany rivers, and their tributaries, which often flow in deep dells. The scenery is wild.

The hills of Yates, Ontario and Livingston, usually presents handsome surfaces, and admit of cultivation to their very summits.

The whole tract, taken together, has a good climate; is healthy, and with few exceptions is adapted to agriculture and grazing.

The hilly parts of Oswego, St. Lawrence and Franklin, have less fertility, and less cultivation. The entire tract is well watered and is healthy.

The fourth tract, is in the county of Clinton. It has the Chatteaugua range of mountains on the west, and the level country along Lake Champlain on the east, embracing the middle parts of the county. It unites the flat and mountainous countries. The lands are moderately fertile.

There are other hilly tracts—some are in Rockland, some in Ulster, and others in various parts of the State; but as they are small in extent, and sometimes insulated, we shall not notice them particularly. We shall make the same remarks in relation to the small champaigns and plains situated within the hilly tracts.

The hilly tracts exhibit the most interesting picturesque, and beautiful landscapes that are to be found in the State. Every where we find something new, varied, and attractive.

The northerly part of Manhatten Island is hilly. Mount Washington, near Fort Washington, is 238 feet high.

Staten Island is divided into the hilly and level tracts. The former is in the northerly part of the island. The hills of this island are not elevated or rough.

The hills on Long Island, in the counties of King's and Queen's, scarcely deserve the name.

CHAPTER III.

CHAMPAIGNS AND PLAINS.

The first that we shall describe, and the second as to extent, is within the basin of the Hudson, and mostly on the west side of that river. It comprises the southern and eastern parts of the county of Saratoga, or those parts south of the mountains, the northeastern and central parts of the county of Schenectady, the eastern parts of the counties of Albany and Greene, a portion of the county of Columbia, embracing the Kinderhook plains, that part of the county of Washington lying to the northwest of the hills of that county, and southerly of South Bay, and that part of the county of Montgomery, situated southeasterly of Mayfield mountain, and between the Sacondaga and Mohawk rivers. It is bounded on the north by the Sacondaga mountains, on the northwest and west by Mayfield mountain, and the hilly tracts of the counties of Schenectady, Albany and Greene, and on the east, pretty generally by the Hudson, and the hills of the county of Washington. Its length from north to south, is between eighty and ninety miles, and its breadth, from east to west, from four to forty miles, averaging about sixteen. It is divided into champaigns and plains. The former are in the county of Greene, and in the counties of Albany, Schenectady, Saratoga and Montgomery. The tract, taken together, displays either a flat or gently waved surface, which rises by very easy gradations from the hills, along the Hudson. The soils differ considerably in quality, but in the main, are good or middling, and with suitable cultivation, may be rendered very productive. Indeed, the lands of the champaigns are all of that at present. The soils of the plains consist of sand, sandy loams, gravel and clay, resting on shistic rocks, and in some instances, limestone rocks, marls and clays, and have been deported from the northern regions. None of

the rocks *in situ*, would, by disintegration, produce such soils. The soils have no great depths since all the rivers and streams descending into the Hudson, have laid them bare, and now flow beneath their base, and since, permanent wells have, in general, to be sunk below them. The usual depth of the sand is from ten to thirty feet. The loams and gravels ordinarily have less thickness. In the midst of these sandy and gravelly plains, are some productive spots, which now and then have extents of a thousand acres or more.

The plains contain not far from one half of the tract, and extend from near the head of South Bay, on Lake Champlain, southerly into Greene.

The Kinderhook plains, lying on the east side of the river, are separated by the Hudson. These plains, in constituents character, &c. are like the preceding, only they are more productive.

In the county of Montgomery, sandy and gravelly plains, of limited extent, occur in several places between the Mohawk and Sacondaga rivers. That at Kingsbury, in the town of Johnstown, is the largest.

The champaigns in the county of Greene, situated between the Hudson and hills, have great beauty. The same may be said of those in Albany, Saratoga and Montgomery.

The second which we shall notice, is a champaign of small extent in the county of Ulster. Its western bounds are the hills which connect the Shawangunk and Kaatskill mountains, and its eastern the Hudson. In breadth varies from two to six miles. Its declination is towards the Hudson.

Between the Hudson and Nyack hills, in the county of Rockland, there is a small champaign tract, possessing richness.

The third which we shall attempt to describe more at large, comprehends portions of the county of Cayuga, lying south and north of the Oneida and Seneca vale; most of the counties of Seneca, Wayne, Ontario, Oswego and Jefferson, and parts of St. Lawrence and Franklin. This tract is bounded on the north and northwest, by Lake Ontario and St. Lawrence river;

on the east southeast and south by the hilly tracts before noticed, and on the southwest by the great western plain. Its length on the side of Lake Ontario and St. Lawrence river, exceeds two hundred miles.

The surface is either flat or some what undulated, and taken together, descends towards Lake Ontario and St. Lawrence river. Independant of the general slope, there are others towards Cayuga, Seneca and Canandaigua lakes, Canandaigua outlet, Mud creek, Oswego and some other rivers. The slopes towards Cayuga and Seneca lakes, are from east to west, and from west to east, and opposite to their courses. Those towards Mud creek, Canandaigua outlet, are also opposite to their courses. Part of the Oneida and Seneca vale lies in this tract.

The Ontario and St. Lawrence border, or that strip which lies immediately in their vicinity, is a plain of easy declivity and of almost uniform appearance. Every where we are presented with levels, on which there are few inequalities. Often the descent towards Lake Ontario and St. Lawrence river, is so easy that the eye does not take it in. The ancient beach of the lake, or at least portions of it, are to be seen in this plain, as far as Black river on the northeast. Indeed the beach is well defined to Grest Sodus Bay, and serves, at this day, for a public road. We should be disposed to include the whole Ontario border, in the great western plain, had it more breadth at the western end. The St. Lawrence part of the border has less smoothness than the Ontario. Its surface is less dry, it abounding more in swamps, marshes, lakes and ponds.

That part of the county of Cayuga, between the Erie canal and the hills on the south and east, descends with much uniformity, westwardly to the lake and its outlet. Its aspect is very little roughened; the few inequalities being some loamy, sandy and gravelly swells and ridges of small elevation. The greater part of these are neighbouring the canal, or Seneca and Oneida vale.

Between Cayuga and Seneca lakes, the country is moderately uneven, and rises from their respective shores, in low hills and ridges.

Between Seneca outlet and the vale of Canandaigua, through which the Erie canal runs, the Montezuma marshes, and the county of Ontario, the country is mostly a plain. In travelling westwardly from those marshes to Geneva in Ontario, at the head of Seneca lake, we behold nothing but one uniform level, and if we travel northerly, it must be some miles before we see any thing otherwise. On the side of Seneca outlet, the declivity scarcely suffices to carry off the waters.

Ontario county, as far west as Canandaigua lake, has a gently inclined surface, which descends towards Seneca and Canandaigua lakes, and the Erie canal. The whole seems to be a kind of plain, rising from all of those sides. The space between Geneva and Canandaigua is mostly composed of low ridges with intervening swales ranging northerly and southerly. The district between these lakes has hardly a parallel in point of richness and beauty in the State.

Wayne, lying north of Ontario and Seneca, has also a moderately variagated aspect. Those parts adjoining Mud creek and Canandaigua river are the most uneven. These, however, can only be ranked among champaigns. The Ontario border, situated northerly of those streams, we have already described, as a plain of very easy descention towards that lake.

The champaigns of Oneida are between the hills and the Oneida and Seneca vale, and to the northwest of the village of Rome. The former appear to very fine advantage in travelling on the great road from Utica to Oneida creek, &c. and from some of the hills southerly of that road.

The champaign towns of Columbia, Warren and Manheim, in the county of Herkimer, exhibit beautifully diversified aspects. The former are at the extremity of the Susquehannah valley. A part of Springfield, in the county of Otsego, might be added since its aspect is analagous.

PLAIN OF THE WEST.

THE western plain commences four, five, six and even seven miles east of Genesee river, and extends westwardly to the river Niagara and Lake Erie, where it enters the Province of Upper Canada, and continues the same direction. It is bounded on the east by the preceding champaigns, and some portion of the hilly tract before noticed; on the north by Lake Ontario, and on the south by the Chatauqua and Alleghany hills. To describe, or speak of its boundaries on the west, would be foreign to this work. That part lying within this State is upwards of eighty miles in length, from east to west, and from thirty to forty in breadth, from north to south. On the west it is separated from Upper Canada, by Niagara river, or strait, and Lake Erie. It contains the counties of Niagara and Orleans, and most of the counties of Munroe, Livingston, Genesee and Erie. It is traversed from west to east, by two rocky ledges, which, in some respects, divide it into three plains, which rise one above the other, like steps or terraces. These steeps or ledges have only single declivities, and these severally face and decline towards Lake Ontario. On the borders and across the vale of Genesee, these steeps sink to the level of the country or are hardly visible. These steeps range the plain lengthwise, and are from ten to fourteen miles distant from each other. On Genesee river they are fourteen miles apart, and on the Niagara about fifteen, making some allowance for the tortuousness of its bed. Between these given lines they are less.

The nothern steep is from four to ten miles south of Lake Ontario; and the southern from fourteen to twenty-two miles. These steeps are mostly ledges of limestone rocks, being simply offsets from the upper plain towards Lake Ontario. The Erie canal runs at the foot of the nothern steep, eastwardly almost to the flourishing village of Rochester on Genesee river. The whole plain has four slopes; one towards Lake Ontario, which is general; one towards Lake Erie and Niagara river; and two towards Genesee river, which face eastwardly and west-

wardly. The streams, in certain respects, announce the slopes. The lower plain or terrace, however, has but a single slope, and that dips in the direction of Lake Ontario.

The surface of the entire plain displays little else than one vast level; the steeps and some few insulated eminences, scarcely forming exceptions. The soils, though somewhat diversified, may, without exaggeration, be pronounced fertile.

The general altitudes of the separate terraces forming the plain, may be set down as follows: First, the lower, from 20 to 270 feet above Lake Ontario; second, the middle, from 270 to 325 feet; and the third, from 325 to 470 feet. The surface of Lake Ontario is 230 feet above tide-water on the Hudson, and that of Lake Erie 565. The Rochester level of the Erie canal is 500 to 504 feet, or 270 to 274 above Lake Ontario. The most elevated part of the plain is between Genesee river and Lake Erie.

The great road leading from Utica to Buffalo runs through the whole plain. The ridge road also runs entirely through it. Genesee river, Buffalo, and its kindred branches, Tontewanta, Oak Orchard creeks, &c. flow through this plain, in beautiful meanders.

There is another plain in the west, that claims our attention. It stretches along the southeasterly shore of Lake Erie, commencing a few miles southerly of Buffalo, to the Pennsylvania triangle, some what over fifty miles. Its breadth fluctuates between three and seven miles. The Chatauqua ridge, and some hills lying between its base and the western plain, limit it on the southeast; while Lake Erie leaves it on the northwest. The extremes of this plain pass on the one hand into Pennsylvania, and on the other into the western plain. The acclivity from the shore of Lake Erie, to the Chatauqua ridge, is very easy, and often scarcely perceptible to the eye. On this plain there are few or no inequalities, but the ravines of streams.

There is a small beach, beginning a few miles southwesterly of Cattaraugus creek, that runs to the triangle of Pennsylvania. Its course is between the shore of the lake and the foot of the

ridge. It is not so broad, high and uniform, as the Ontario beach is, on which the ridge road is constructed. It stops on the banks of all the streams, which cross the plain, being in pieces. On the lake side its slope is longer and better defined, than on the Chatauqua side. Like that of Ontario, the land side is often wet and swampy.

In the counties of Clinton and Essex, there is a champaign considerable as to extent. In some parts it is so level as to merit the name of plain. It extends from the northern parts of Essex northwardly, into Lower Canada, beyond latitude forty-five. Its extent, in this State, is about forty miles, and its breadth, from four to eight or nine miles. On the east lies Lake Champlain, and on the south and west, hills. In Lower Canada it comprises most of the space between Sorell and St. Lawrence rivers. Its surface is either flat, or commodiously variagated with low swells. The lands are commonly good. The state road running from Albany to Lower Canada passes through it lengthwise.

PLAINS ON LONG ISLAND, &c.

THIS island is separated from Connecticut by the Sound, and from the county of Westchester and Manhattan Island, by East river, and from Staten Island, by New-York Bay and the Narrows. The Atlantic Ocean washes it on the south and east. It is one hundred and fifteen miles long, extending from the Narrows eastwardly, to Montauk Point, and twenty broad. Its average breadth, however, does not surpass ten miles. A ridge of granitic hills, denominated the spine, divides it into two very unequal parts. The spine stretches from the west end of the Island eastwardly, to River Head, a distance of about sixty miles. This ridge has summits from one hundred to four hundred feet, perpendicular elevation, above the ocean. Harbour Hill, in the town of Hempstead, in the county of Queen's, is supposed to be the highest land on the island.

The country lying southwardly and eastwardly of the hills, comprising the greater part of the island, is mostly a plain of a very uniform level and aspect, being but little elevated above the ocean. Sand and sandy loams are the predominating soils. Hempstead plain, in the county of Queen's, is embraced in it. Its extent, from west to east, is sixteen miles; and from north to south, from four to eight. It is almost a dead level. Heath grass, cassually interspersed with small coppices of dwarfish bushes, overspreads its surface. Southwardly, and adjoining this plain, lies another, of the breadth of two miles, called the Shrub Oak Plain, on account of its being overspread with dwarfish shrub oaks few of which exceed four feet in elevation.

The plains of Long Island, are considered by some to be alluvial, and to have been formed by the Gulf Stream. The same persons would fain induce us to believe, that the whole coast southerly from Sandy-hook, had been formed by the same agent. In another part of this work we intend to show the fallacy of this hypothesis.

CHAPTER IV.

VALES AND VALLEYS.

THE Vale of Oneida and Seneca is bounded on the east by the upper part of the valley of the Mohawk, on the south by the rising grounds and the hills lying south of Erie canal, on the west by the termination of the valley of Canandaigua river and the champaigns, lying south and north of that valley, and on the north by a ridge of moderate acclivity, lying between Seneca and Oneida rivers, and Oneida lake on one side and lake Ontario on the other, and the foot of the Highlands of Black river and Hassencleaver mountain, situated between Oneida lake and the Mohawk and Black rivers. It is between eighty and ninety miles in length from east to west, and from two to sixteen in breadth from south to north, and contains about nine hundred square miles, of which ninety are water. Oneida, Onondaga and Cross lakes, together with some ponds, are situated within it. The Mohawk, Oneida, Seneca and Oswego, are the cheif rivers. It comprises parts of the counties of Oneida, Madison, Oswego, Onondaga, Cayuga, Seneca and Wayne, and touches upon the county of Herkimer, The lands which it contains, except those along the Mohawk and Oswego rivers, rise very gradually on all sides from the shores of Oneida lake and the banks of Oneida and Seneca rivers, and terminate in the hills, ridge and champaigns environing them. This vale in its whole extent is extremely flat, so much so that a hill one hundred feet high can scarcely be pointed out. The rivers and streams with which it is so bountifully supplied, wind in thousands of sinuosities, and inundate large tracts in the vernal and autumnal floods, whence the waters drain off very tardily. The soils are diversified, consisting of alluvions, vegetable earth, marls, clays of different tenacities, loams, sand, gravel, &c. now separated, and

then huddled together. The swamps and marshes are numerous, and occasionally of considerable extent. The swamp contiguous to the village of Rome, Sullivan swamp, and that along Seneca river below the Montezuma marshes, severally contain many thousand acres. The Montezuma marshes comprise not far from twenty thousand.

This vale has very much the appearance of having once been the bottom of a large lake, which has been left bare by the lowering of the rocky barriers on the sides of the Oswego and Mohawk rivers, which at present are the only egresses for the passages of the waters that congregate in it.

More than three-fourths of this vale is still covered with woods and without inhabitants. The settlements already made, are mostly on or near the line of the canal, and along the Mohawk. It contains the villages of Utica, Whitesborough, Oriskinny, Rome, Vernon, Canestota, Syracuse, Salina, Liverpool, Geddysburg, Jordan, Weeds Port, Buckville and Montezuma. These are, with the exception of Vernon and Liverpool, either upon or near the banks of the canal.

The whole vale is naturally divided into three parts: the first is towards and at its east end. It embraces the country along the Mohawk, from Frankfort, in the county of Herkimer, westwardly to Rome, and is eighteen or nineteen miles in length, and from two to six in breadth. A portion of the Great Swamp lying south of the village of Rome, is in it. The swamp, at this place, is nearly three miles broad. It is timbered with cedar, and is partly submerged. Its sedentary waters drain off very leisurely into the Mohawk river and Oneida lake. The second embraces all the country around Oneida lake and along its outlet, and is about forty miles in length from east to west, and from six to sixteen miles in breadth from north to south. On the east it comprehends the lands along Wood creek, from the Rome summit level westwardly; the lands along Fish creek almost up to its forks, and the lands along Oneida creek, as far as the castle, together with the lands between those streams. On the south side of Oneida lake it includes the lands southwardly to the canal, and in some instances south of it. The canal, how-

ever, may be considered a tolerable boundary west of Oneida creek, as far as the Montezuma marshes. On the north side of the lake, the lands extend back to the foot of the hills, and the declivity of the ridge or spine, five, six, or more miles. Along Oneida river it includes the lands between the ridge on the north, and the canal on the south. The third lies along Seneca river, around Onondaga lake, and along the lower parts of Canandaigua and Seneca outlets, and is twenty-eight or thirty miles in length, and from five to fourteen or more in breadth. The hills bound it on the south, and the ridge lying between Lake Ontario, Seneca and Oneida rivers on the north. In travelling westwardly on the great road leading from Utica to Buffalo, we have several extensive views of this vale. The first is from the hill west of Oneida creek; the second is from a hill in Lenox; the third is from Chitteningo hill in Manlius; the fourth is from Onondaga hill; and the fifth is from a hill in Camillus. Combining these several views, we take in the greater part of the vale, the whole appearing an almost uniform level, mostly covered with woods, and surrounded by hills and eminences. The views from Chitteningo and Onondaga hills are the most extensive and the best, because we take in the widest ranges.

From the head of Oneida lake eastwardly to the Rome summit level, a distance of thirteen or fourteen miles, the ascent is only sixty feet. A similar ascent is found to obtain at the Erie canal, distant in a southerly direction, from four to eleven miles. The ascent on the north side, to the foot of the hills and the ridge or spine already spoken of, is perhaps not greater. Between Rotterdam on Oneida lake and Great Salmon river, the summit level is only one hunderd and ten feet above the lake. The distance ftom the lake to the summit is seven miles, and the acclivity easy. The surface of Oneida lake is about three hundred and seventy feet above that of the ocean, and very nearly on a level with the surface of the Mohawk, at the head of the Little Falls in the county of Herkimer. The ascent up Seneca river is exceedingly gentle; so is the ascent generally from that river to the hills on the south and the ridge on the north. The

few inequalities do not deserve the name of hills. Onondaga lake is only six or seven feet lower than Oneida lake. Cross lake hardly surpasses Oneida in elevation. The Montezuma marshes are not above ten feet higher than Oneida lake. On comparing the heights of Oneida, Onondaga and Cross lakes, and those of Oneida and Seneca rivers, the Rome and other summit levels, and those of the Erie canal, it is obvious that the whole vale is nearly on a level; and it is also obvious that sedentary waters formerly covered it. Three dams thrown across its avenues, and raised to the height of from forty to sixty feet, would suffice to lay the whole under water, and render Oneida, Onondaga, Cross and Cayuga lakes, Oneida and Mohawk rivers, &c. invisible. A mound or dam on the Mohawk at Frankfort, where the hills advance upon the river, forty-five feet high, would raise its waters above the Rome summit level, and cause them to flow westwardly into Oneida lake. The narrow space between the Mohawk and Wood creek, at this approximating point, is almost a dead level.—The swamp south of Rome is absolutely so, its waters flowing both ways. In former times before clearings were made along the Mohawk in these parts, and before its bed was freed from drift-wood, during very high floods its waters used to spread over this swamp, and make their way westwardly into Wood creek, as well as eastwardly by their natural chanel, into the Hudson. A ditch ten or twelve feet deep, drawn from the Mohawk to Wood creek, and sloping in that direction, would divert the entire stream and occasion it to descend into Oneida lake. We shall enter into some particulars in relation to its marshes, swamps, &c. and shall then conclude with some general observations.

The Montezuma marshes begin at the foot of Cayuga lake, and extend northwardly along the outlet and Seneca river fourteen miles, with an average breadth of two and an half. or three miles, exclusive of an island or tract of solid ground. The tract of solid ground is over against the village of Montezuma. It stretches from south to north six miles, and has a breadth from one mile to a mile and a-half. Three or four ridges with intervening swales diversify its aspect, The Erie canal passes by

the south end. That part of the marsh lying on the east side, is from two to two miles and a-half broad, and that lying on the west from half a mile to a mile. The whole breadth where the road crosses, including the solid ground, is rather over four miles. This road may be called a causeway, since it is raised two or three feet above the surface. Seneca and Cayuga outlets, and Canandaigua and Seneca rivers meander through these marshes. They are dark sluggish streams, whose waters are urged by no rapids, and enlivened by no murmurs. Nothing accelerates their movements on this almost dead level but the superior masses pressing upon the inferior. These marshes are clothed with grass which rises to the heighth of three or four feet. In summer they have a green tint, and at a short distance appear like extended meadows. The surface is loose, yielding and humid. They are mostly environed by swamps and wet lands. The great Seneca Swamp commences where these end, and runs down Seneca river, occupying both its banks to Cross lake, &c. It is a mile or two broad. The marshes and swamps have the appearance of having once been the abode of standing waters. The former have something peculiar in their formation, and seem to have been formed by the destruction of vegetable matter and animal remains, mixed with extraneous earths brought down by the streams. There are three distinct layers or strata. The first is vegetable earth, and has a thickness varying from two to four feet and upwards. This constitutes the superficial layer, and is based upon marl. The second layer is marl, and has a thickness of from three to four feet or more. This supports the preceding. The third is composed of vegetable earth resembling the superficial stratum, with this difference, that it is more consolidated. Its thickness varies from three to four feet, &c. The layer of marl rests on it. Common earth, &c. supports the whole.

The first and third layers are as yet very imperfectly decomposed, and appear to be chiefly composed of vegetables, such as lake and marsh grass which grew on the spot. The decomposition is so very incomplete, that we can readily, on examination, dicover the grassy fibres. These earths have very little cohesion, and may be termed lake and marsh peat. The third

belongs to the former, and the first to the latter. They were formed at two distinct and distant periods.

Several theories have been advanced in order to account for these formations and fillings up, but they do not appear reasonable and satisfactory to us. According to that which has been generally received, and which has the most plausibility, Cayuga lake has had two subsidances and one rising. This theory supposes that the vegetable earths were formed during the subsidances, and that the marl was transported from a distance in the course of the rising. Without attempting to refute this theory, we shall venture to propose one, which we think will account for these formations; but we shall not have recource to risings and fallings, and extraneous agents.

The filling up of lakes, the lowering of their issues, their reduction and subsequent effacement, are among those splendid operations in nature, which are always marching onward, and which endeavour to render the surface of the whole earth dry, and to facilitate the course of rivers from their sources to their mouths. As long as a river passes through a lake or part of it, the alluvial matters which it carries down, will be mostly detained. This must have been the case with Cayuga lake in its original state. Then Seneca outlet and Canandaigua river discharged their waters where these marshes are at present. The redundant waters of the lake also passed off over them. Then most of the alluvial earths brought down by these streams must have been arrested and detained. In the lapse of time the bottom became more and more elevated by these annual depositions: the issue or drain of the lake by abrasion became lower and lower; and the water consequently became less deep. We think that three distinct periods may be designated in the formation of the layers. We shall take them up one by one.

In the first period, the bottom of these marshes, owing to the depositions, the subsidance of the water, and the depression of drain, became covered with aquatic grass, probably such as now grows and abounds about the outlet of the lake in its shoal waters. This was subject to annual decay and re-production.—The growth or produce of one year died and fell upon that of the

preceding, and so in succession during that period. The alluvial and other matters which came along with the annual freshets, were stopped and detained, and became confounded with the grass, and formed a kind of cement. In the second period, fresh water shell fish succeeded the grass, and nearly, or quite extirpated it. These, it is well known, multiply in prodigious numbers, in shoal waters, which are not much agitated by winds and currents, which was the case here. Considerable numbers have found their way into the Erie canal. These would have covered its bottom in certain places, had not the waters been drawn off every year at the close of the navigation, which has occasioned their destruction in a great measure. We have simply introduced this example, to show the rapid production and reproduction of these animals. The destruction of shell fish in the course of this period, must have generated large quantities of calcareous matter: the streams must also have brought down considerable quantities of alluvial matters. These subsiding, coalesced with the recrements of the shell fish, and formed the stratum of marl. Fluviatile shells produce calcareous beds, which are not often much consolidated, which is the condition of this bed or layer. Its colour is a pale yellow bordering upon white. To this, however, there are exceptions. In some places the marl is of a greyish or blueish colour, while in others, the shades are intermediate. The difference in the colour is occasioned by the alluvial depositions and the destruction of grass which grew on the spot. At the close of the second period, the bottom, owing to the formation of the stratum of marl, and the deepening of the issue, and the consequent decrease of the water, became so much elevated as to be nearly bare, and the shell fish being unable to live in its shallow waters, died. The third period comes down to the present time. Grass succeeded the shell fish. This grew up every year, and then died and fell down and decayed. The annual alluvial matters were stopped as usual, and mingled with it. The same process is still going on, only there are not so many alluvial depositions.

Such seems to have been the origin of the three layers. The operations of nature were slow, constant and steady. No

terior agent could have participated in their formation. The production of each was natural and uniform. The layers have an identity in extent and thickness; at least, such as might be expected in such works.

The other beds or formations of calcareous marl, so frequently found in the Oneida and Seneca vale, appear to have been formed in the same manner. In all the beds that have been opened, shells have been found in such perfect states of preservation, that not only the order, but the genera and species could be determined. At Rome, Manlius, Camillus, and other places on the line of the Erie canal, and around Onondaga lake, where excavations have been made since 1816, great numbers have been seen. Many now reside in the shoal waters of the latter lake, and in other collections of standing water. The shoals of this lake, and the bottoms of the other collections of water, where they now exist and propagate, consits of the same kind of marl. Onondaga lake is surrounded by a belt of marl which is covered with water every spring. Since the lowering of the drain of this lake, most of the belt is bare in dry times. The marl of this belt has very little cohesion or firmness. It yields under the feet when you walk upon it. The want of cohesion and firmness is mainly owing to the newness of the formation. The external part of the belt has most, and the internal least.

At the outlet of Onondaga lake, lignites or submerged wood have been found wrapped in the marl, from two to six feet below the surface. Some of the logs were entire, and little if at all flattened or distorted. The swamps and wet grounds comprise nearly all the country along Seneca and Oneida rivers, and much of the country around Cross, Onondaga and Oneida lakes. The canal, in the town of Camillus, passes through a cedar swamp, which is upwards of three miles long. Marl underlays this swamp and constitutes the canal's bed. The cover of the marl is black vegetable earth. Sullivan Swamp, which is in the counties of Onondaga and Madison, on Chittiningo creek and its confluents, abounds with marl. It is chiefly on the north side of the canal. Its surface, including its ramifications, has nearly as much extent as that of the Montezuma marshes. The

superficial soil is a black vegetable earth bordering on peat.—Its thickness varies from a few inches to some feet. All the cedar swamps have similar coverings. The swamp south of Rome, in the county of Oneida, occupies parts of the towns of Rome, Verona, &c. and is said to be still larger. The swamps along Oneida, Wood, and Fish creeks have no mean extent. Many of the swamps in the vale are timbered with black ash and black alder The soil of these swamps, especially where ash prevails, is firmer and more cohesive than that of the cedar swamps.

The clayey, sandy and loamy tracts occupy considerable portions of the vale. The clays have different tenacities and vary in quality. In some places they are rich, and in others meagre. The same may be said of the loams. The only sandy tract deserving of attention, is situated northwest of the village of Rome. It is a plain about five miles long and three broad. It is not entirely in the vale. In aspect and constituents, it resembles the Albany and Saratoga plains. It is chiefly timbered with pitch pine. The humid, swampy and marshy spots contain bog iron ore. The basis rock of the plain is grey wacke slate. The sand has no great depth, since the streams often flow beneath it, and since wells are often sunk to the rock. The sand composing these plains, seems to have been brought from a distance.

The superficial soil of the vale of Oneida and Seneca is mostly alluvion, or lake and river deposites, transported from the upper countries neighbouring thereto, by the many streams which formerly discharged their waters into it while it was a lake, and which still flow into it, and from thence into lake Ontario and the Hudson, by the rivers Oswego and Mohawk. These deposites consisted then, as they now do, of earthy matters, taken up by the waters and carried down into the lake, where they subsided and formed beds and layers more or less thick and extensive.—By means of these deposites and subsidances, the bottom of the lake became every day more and more elevated; the drains became every day more and more depressed. Hence the waters became shoaler and shoaler, and the circumference lesser and lesser. The streams which fell into it became longer and longer.

The principal places of deposite, that is, those adjoining the streams, shifted and followed the lake as it shrunk, till at length they reached the borders of the present lakes and the rivers which issue out of them. The same process is now going on, but upon a smaller scale, owing to less water, less declivity and fewer materials, and will go on until the present lakes are filled up, and so obliterated, that nothing will remain of them but the beds of rivers and creeks. Oneida, Onondaga, Cross and Cayuga lakes are only the fragments or ruins of a lake which covered the whole vale. The means which nature employed in filling up the bottom, levelling the barriers and obliterating the original lake, and which she is now employing in filling up, levelling and effacing the small lakes which now remain, are analogous to those she employs in filling up swamps, marshes, pools and mill-ponds. The operations of nature are very nearly the same in all the cases cited. The main difference seems to be in the magnitude. In the case of lakes we cannot follow her, because she consumes ages in a single operation ; but in the case of mill-ponds, &c. we can, because she performs it in less than an age. Here, then, there is no mystery ; nothing above human intelligence ; nor would there be in the other case, were our existence co-extensive with that of nature. The works of man are confined to a precarious age ; those of nature have no bounds.

Besides the marls, vegetable earths, alluvions, &c. enumerated, there are beds of shale, indurated clay, gypsum, water limestone, calcareous tufas, &c. The beds of shale and indurated clay are of frequent occurrence. In making the Erie canal several were met with. The gypsum is sometimes covered with clay and marl, and at others with a slaty rock. It is a valuable manure or fertilizer. The fresh water limestone is impregnated with quartzose matter, and contains abundance of fresh water shells. It may be ranked among the newest rocks. It makes an excellent and durable cement. The tufas are in Manlius, &c. They are of late formation and are annually enlarging.—They are porous and compact.

Our most valuable salt springs are in this vale. May not the beds of salt which communicate the saline matters to the

waters of these springs, be situated within it or contiguous to it? Red sandstone underlays the strip of land which contains these springs. Patches of clay, of marl and gypsum occur in their vicinity. "Abundance of gypsum has been found associated with the salt water at Onondaga," &c. *See an Essay on our Salt Springs, by Dr. J. Van Rensselaer.*

VALE OF GENESEE.

THIS vale is upwards of thirty miles in length, and from two to four in breadth. It commences at the foot of the Alleghany hills, about ten miles below Nunda, and runs down the river Genesee almost to the rising town of Rochester. On the east it is bounded by champaigns, on the south by hills, and on the west by the western plain; indeed in some respects, it constitutes a portion of that plain, and as such, we have included it. The lands which it contains are very rich. The Genesee makes its way through this vale, in reaches and beautiful windings, imparting to it richness. This vale occupies parts of Livingston, Genesee and Monroe counties. It is mostly, however, in the first. The Agoneaseah possesed this vale till 1791. They had several villages and hamlets in it. On the richest bottom lands, they planted corn. The Canton called by us, the Seneca owned it. Throughout the extent of the vale the Genesee is navigable for boats. Geneseo and some other villages and hamlets are in it.

VALE OF TONNAWANTA.

THIS vale is in the counties of Niagara, Erie and Genesee, and occupies both sides of Tonnawanta creek, upwardly about thirty miles. It is from two to four miles broad. The Reservation of the Senecas is in it. Its surface is very level and uniform. It is mostly covered with woods. The lands which it contains are of various qualities. The southern steep crosses

this vale, and divides it into two parts. Tonnawanta runs through it, making many curves and sweeps.

The vale of Ithica, at the head of Cayuga lake, is about five miles long and two broad, where it opens into the lake. It is nearly environed by hills, which rise like an amphitheatre. The lands are fertile and well watered. Ithica, the shire town of the county of Tompkins, containing about 300 houses, is in it, about two miles from the lake. Large boats ascend Fall creek as far as the town.

Clove-vale, in the town of Beekman, county of Dutchess, is six miles in length and two in breadth. It is watered by Clovekill, a fine stream. This beautiful vale is situated between two mountains.

The vale of Wallkill is about twenty-five or thirty miles in length, and from two to six in breadth. It is partly in the county of Orange, and partly in the State of New-Jersey. Its superfices contain not far from eighty thousand acres of land. The drowned lands bordering Wallkill river, constitute its most important feature. These lands have, in the last fifty years, been mostly reclaimed. Smith, in his History of New-York, published nearly one hundred years ago, remarks that these lands were mostly flooded every spring. The drowned lands, and indeed all the lands contained in it, are rich. The Wallkill, in that part of its course, which is through this vale, is a crooked sluggish stream with low banks. The extent of this vale is from south to north.

There are many other vales in the State which possess great beauty and fertility, but we shall have to omit descriptions of them, since they would swell this work too much.

VALLEYS.

In noticing the valleys of the State, we shall have to confine our remarks to the principal, or such as have some peculiar characteristics. Descriptions of the whole would be two irksome to the reader. Besides, in many instances, they would be

little else than repetitions of the same things. Most of our river valleys have similarity in appearances, characteristics, &c.

VALLEY OF THE MOHAWK.

This valley is about seventy miles in length, and in some places a mile in breadth. It stretches from west northwest, to east southeast. On the west, it opens into the Oneida and Seneca vale, and on the east, into the flat country around Schenectady. The hills that bound this valley are from one hundred to four hundred feet in height, at the distance of half a mile from the river. In some places they rise by easy gradations, and in others with abruptness. In viewing the valley in detail, it will be found to be divided into three parts; the upper, the middle, and the lower. The first comprises the space between the Oneida and Seneca vale, and the Little Falls, and is about nineteen miles in length. Fall Hill in a measure separates it from the middle. It contains the villages of Frankfort, Herkimer and Little Falls.

The second comprises the space between Fall Hill and Anthony's Nose, and is twenty-two miles in length. It contains several villages and hamlets, such as Canajoharie, Fort Plain, Palatine, St. Johnsville, the Indian Castle, &c.

The third comprises the space between Anthony's Nose and the flat country, near the city of Schenectady, and is about thirty-four miles in length. The villages of Caughnewaga and Amsterdam are in it.

The lands in this valley are in general good. The Mohawk flats are famed for their great fecundity.

Between Schenectady and Utica, there are two roads which run along the foot of the hills, bounding the valley, sometimes on the banks of the river, and at other times a little back. The one is on the north, and the other on the south side of the stream. They are now and then nearly interrupted by several projections and narrow defiles. The traveller is often relieved

and highly pleased with the diversified scenery presented to his view. He has before him, at one time, the beautiful, at another the picturesque, then the romantic.

The valley of Schoharie is along the creek of the same name, in the county of Schoharie, and is eighteen or twenty miles in length, and from half a mile, to a mile and a-half in breadth. It ends at the State bridge, twenty-eight miles westwardly of the city of Albany. It contains the villages of Middleburgh, Schoharie, Sloansville and Esperance. The flats of this valley may be ranked among the richest river lands in the State. The hills that bound the valley are sometimes rough and sometimes smooth. The Schoharie creek, (which deserves the name of a river,) runs in beautiful reaches and curves, through this valley.

The valleys of Sauquait and Oriskinny, in the county of Oneida, although inconsiderable in extent, are interesting on account of their richness, and the number of cotton and woollen manufactories they contain. The former is from half a mile to a mile broad, and the latter from one to two miles. The Sauquait and Oriskinny are handsome streams.

The Chenango valley is in the counties of Madison and Chenango, along the river of the same name. It is bounded by two chains of hills, and is now and then a mile broad. The Chenango, which waters this fine valley, is a main branch of the Susquehannah.

Along Unadilla, Tioughnioga, Conhocton, Canisteo and Alleghany rivers, there are valleys which are considerable as to extent and breadth. In general, the lands contained in them are rich. The same remarks will apply to the valleys along Mud creek and Canandaigua river. That along the latter river, before it opens into the Seneca and Oneida vale, has a breadth of two miles.

"The vale of Conewango, in the county of Chautauqua, stretches along Conewango creek. It is, in some places, seven or eight miles wide. When the rich alluvion lands in this vale are properly cultivated, they will not be surpassed by those of Genesee river. This vale has, like many others, strong marks

of having once been covered with water. The deposites of alluvion in some places are twenty or thirty feet in thickness, as is evidenced by wells which have been dug." I am indebted to James O. Morse, Esq. of Cherry Valley, for the description of the Conewango vale.

The valleys of Hoosac and Esopus contain considerable tracts of the best lands in the State. Hoosac river and Esopus creek are large streams that annually overflow their banks.

Besides the valleys described and noticed, there are many others which merit attention, but as we have before remarked, we must pass by them.

SWAMPS AND MARSHES.

First, Tonnawanta Swamp.—This swamp, which has greater extent than any other in the State, is situated in the counties of Genesee, Orleans and Niagara, mostly, however, in the two former. It is twenty-five miles in length from west to east, and from two to seven miles in breadth from south to north. It is bounded on all sides by plains, which are elevated but little above its surface. The whole swamp, taken together, is very nearly a level, and exhibits great sameness of aspect. In spring and fall the waters accumulate and overspread the greater part of it. These drain off very slowly, on account of the extreme flatness of the land, and the consequent want of declivity to the drains. The superfices of the swamp are estimated at from 40,000 to 50,000 acres of land. The soils are various in qualities, but it is supposed they are all tillable. The swamp might be drained at no great expense.

Oak Orchard creek, in its way to Lake Ontario, winds through Tonnawanta Swamp. Tonnawanta creek, in its way to Niagara river, approaches within a mile of this swamp. Its bed is three feet higher than the swamp, at the approximation. The ground, however, between the creek and swamp is five feet higher than the former. The canal commissioners, in order to increase the waters of the feeder, taken out of Oak Orchard,

have caused a ditch to be made from Tonnawanta creek, by which a portion of its waters now flow into the former stream, and thence into the canal by the feeder. The general level of the swamp Mr. Geddes computes to be about ten feet above Lake Erie.

The swamp along Seneca river, and those of Camillus, Sullivan and Rome, are all considerable for extent, but as we have noticed them in treating of the Oneida and Seneca vale, we shall do nothing more than name them in this place.

Second, Sacondaga Marsh.—This marsh is in the northeastern part of the county of Montgomery, along Sacondaga and Mayfield creeks. Its length is seven or eight miles, and its breadth a mile or more. It contains four or five thousand acres of land, and is mostly covered with marsh grass. Every time Sacondaga river overflows its banks, it is in part or wholly submerged; on such occasions, that river not only prevents the waters of Sacondaga creek from flowing onward, but detaches portions of its own up that creek, from whence they are diffused over the surface of the marsh. The Dutch called this marsh Vlaie: at present, it is known by the name of Fly, which we consider a corruption of the former word.

The soil of this marsh is a blackish kind of vegetable earth, possessing little or no cohesion. Hence, the surface is loose, spungy and miry, and not easily passed. In truth, there would be no such thing as walking on it were it deprived of its grassy cover. The surface, in many spots, is elastic, and will bend when you pass over it.

This marsh cannot be drained, it is said, without lowering the bed of the river some miles below the mouth of Sacondaga creek. Should such be the fact, age after age must pass before it becomes sufficiently firm and dry for cultivation.

The bed of Sacondaga creek, below Summer House Point, is very permeable, so much so, that an oar may be thrust in it seven or eight feet with the utmost ease.

Marshes similar to the latter, are of very common occurence in the mountainous country, situated between the Mohawk

and St. Lawrence rivers. They vary greatly in dimensions. Some contain thousands of acres, while others are limited to a few. In certain instances beavers have erected dams across streams traversing or issuing out of them, whereby the waters have been spread over hundreds of acres of land. These marshes are often fringed with black alder and other small bushes. Cranberry bushes often grow in small coppices in these openings.

CHAPTER V.

RIVERS, CREEKS, &c.

THE Hudson* is formed by the union of two streams, denominated the West and North branches. The West, which is the principal stream, rises in a small lake about two miles long and one broad, situated in the western part of the county of Hamilton, five or six miles east of the eastern boundary of the county of Herkimer, and runs northeasterly about seven miles, and then northerly and northwesterly about five miles, where it expands into a lake, about three miles long and two broad; it then issues out at its northeasterly end, and soon after expands into a second lake, about one mile long and nearly of the same breadth. From thence it issues, and after running about seven miles, expands into a third lake about seven miles long, and from one to two broad, extending from southwest to northeast. Then issuing out at its northeastern extremity, it pursues an easterly course about six miles, and expands into a fourth lake, about two miles long and one broad. After leaving this lake it turns and takes a southeasterly direction for seven miles, where it receives a stream from the west, which is about twenty miles long. From thence to its junction with the North branch, five or six miles, its course is easterly. The whole length of the West branch, computing it by its meanders, and including the lakes through which it passes, is nearly seventy miles.

The North branch, which has hitherto been considered the principal stream, rises in a small pond, lying in the counties of Franklin and Essex, thirty-two miles west of Lake Champlain,

*Note—The Mohiccons and Wabingus who inhabited the lower parts of this river, called it *Ma-hack-a-negh-tuck*, also, *Sha-te-muck*.

The Agoneaseah called it *Ca-ho-ha-ta-te-a*, likewise, *Saw-na-tau-ty*. We are unacquainted with the meaning of these words.

and runs two or three miles, where it opens into a small lake. After emerging from it, it crosses the northwestern part of Essex, into the county of Hamilton, and after a course of ten or twelve miles, opens into a second lake five or six miles long, stretching from north to south. Quitting this lake at its south end, it re-crosses into Essex, and takes a southerly course for about ten miles, where it meets the West branch.

A little below the junction, the Hudson is enlarged by a stream from the southwest, fifteen or twenty miles long. About three miles below the junction it receives Jessup's River from the southwest, which is thirty-five or forty miles in length, including its windings, and two small lakes, through which it passes.

Pursuing a southeasterly course, six or seven miles, the Hudson next receives a stream from the north, which is about thirty miles long, estimating its length by its course

After the reception of the latter stream, the Hudson pursues a south southeasterly course, twenty-five miles, in a direct line to the mouth of Schroon river, where it turns suddenly to the west, and then to the south, which course it keeps to Jessup's Landing, nineteen miles. Here it turns short to the east, and flows in that direction three miles; it then flows southeasterly for about two miles; then northeasterly to Glen's Falls twelve miles, and then easterly to Sandy Hill three miles. Here it bends around to the south, and runs in that direction, inclining a little to the west, to New-York Bay, a distance of two hundred miles. The entire length of the Hudson, by its meanders, if we compute it from the sources of the West branch, is about three hundred and fifty miles. The tide flows up to the city of Troy, one hundred and fifty-one miles. Thus far sloops, schooners, and other craft, carrying from sixty to one hundred and fifty tons, ascend. Ships of five or six hundred tons burthen, stop about thirty-one miles lower down. The Hudson affords from five to six fathoms of water from its mouth northerly to the entrance of the Highlands, or Matteawan mountains. Through the mountains to West Point, from eight to ten fathoms: from thence, to near the mouth of the Wallkill, from six

to twelve fathoms; and thence, to the head of ship navigation, generally about five; from here upwardly there is a gradual shoaling, independent of Winne's Bar and the Overslaugh.

The Hudson, after the reception of the Mohawk, is a broad deep and majestic river. At Troy, just below the reception, it is about three hundred and seventy yards broad; at Albany it exceeds four hundred yards; at Hudson it is nearly a mile. Between this place and the Highlands its usual width is three-quarters of a mile. Within the Highlands it contracts, but on leaving them it expands. At its mouth it is a mile and some rods broad.

Tappan Bay, an expansion of the Hudson, commences twenty-five miles above the river's mouth, and extends northerly to Tellar's Point and Croton river It is eight miles long and from two and three-quarters to four and three-quarters broad.

Harverstraw Bay begins three miles north of Tappan Bay, a little above Verdrietege Hook, and ends at Verplank's and Stony Points. It is six miles in length and four in breadth, where broadest. This bay is also an expansion of the Hudson. The place denominated the Horse Race, is at the lower part of the Highlands, between Anthony's Nose and Dunderburg, fifteen miles south of West Point. It is a narrow crooked pass bounded by high mountains.

Winne's Bar is eight miles below Albany, and the Overslaugh three. They are accumulations of alluvial matters, which extend across the bed of the river. The banks of the Hudson abound with beautiful and romantic prospects. Few rivers in the world afford so great diversities.

Note—Van Der Donk says, in the year 1647, in the month of March, when by a great freshet, the water was fresh almost to the Great bay—there were two Whales of tolerable size, that went up the river; the one turned back, but the other stranded not far from the grert fall of the Cohoos. *See Memoir of Egbert Benson, Esq. p.* 69.

The following are auxiliaries of the Hudson:—

The Schroon rises in the county of Essex, near the sources of the Boquet, and runs southerly about eighteen miles, and spreads into the north end of Schroon lake, a limpid sheet of

water, eight or nine miles long, lying in the direction of the stream. On its exit it pursues a southwesterly course to near its mouth, where it turns to the northwest, and soon after enters the Hudson. It is about forty-four miles long including the lake through which it passes. The river from its exit out of Schroon lake, is a sluggish stream, occasionally interrupted by rapids and falls.

Stone Bridge creek, so called from the circumstances of its waters running for a short way under a hill, enters Schroon river on the west, about two miles south of Schroon lake. Its length is about twenty miles, and its course southerly.

The next river that enters the Hudson is the Sacondaga, from the west. This river has its source in the town of Johnsburg, in the northwest part of the county of Warren, and runs southwesterly about twenty-three miles, where it is joined by the outlet of Lake Pleasant from the west, which nearly equals it in size. After the reception of the latter stream, it still continues a southwesterly course for six or seven miles, till it meets the West branch. The West branch heads very near the sources of West Canada creek, a branch of the Mohawk, and flows in a southeasterly direction to the union, passing through several small lakes and ponds. Neither branch, at the union, exceeds thirty miles in extent. The Sacondaga, after the union, takes a southeasterly course for about thirty miles, to the mouth of Sacondaga creek, where it turns and pursues a northeasterly one about ten miles, and then an easterly one about the same distance, to its mergence in the Hudson.

Below the union, Sacondaga receives East and West Stony creeks, two fine mill streams; and at the Fish-house, in Northampton, Sacondaga or Mayfield creek.

The Sacondaga is a very crooked stream. Its current is strong, and its bed broken with many rapids and some falls. It is about eighty miles in length.

Sacondaga creek merits notice. It is constituted by the coalescence of Mayfield creek, and other small streams in the Vlaie, a morass six or seven miles in length, and a mile or more in breadth. Its bottom and banks, from its mouth to

Summer House Point, three miles upwardly, are composed of a blackish vegetable earth, of so soft and permeable a texture as to be nearly impassable unless bound by the rigours of winter. The Vlaie is inundated every time the river surmounts its banks.

Batten Kill enters the Hudson about fourteen miles south of Sandy Hill. It takes its rise in the town of Bromly, in the State of Vermont, on the west side of the principal chain of the Green mountains, near the head waters of Otter creek, and flows in a southwesterly direction twenty-five or thirty miles, to the boundary between this State and Vermont. Here it enters the county of Washington, and then proceeds westwardly to the Hudson. Soon after its entrance into Washington, it is increased by Little White creek, a beautiful stream about twenty-miles in length, which also comes from Vermont.

Batten Kill has several falls, and a very active current. At the Great Falls in Greenich, a few miles above its mouth, the water descends nearly sixty feet.

Fish creek, which rises among the Kayaderosseras mountains, in the town of Corinth, in the county of Saratoga, falls into the Hudson half a mile below Batten Kill. Its length, by its meanders, is about forty miles, but not over thirty in direct lines. It passes through the northerly part of Saratoga lake. This stream, from its source to where it enters Saratoga lake, is called Kayaderosseras, and from its emergence to its mouth, Fish creek. Its banks, from Ballstown Spa to Saratoga lake, are low, and are bordered by extensive flats, which have a breadth of one mile in some places.

Hoosac river next discharges itself into the Hudson, about fourteen miles south of Batten Kill. It has its source in the northwestern part of the State of Massachusetts, and is made by the junction of two streams near Williamstown. Neither stream is more than fifteen or sixteen miles long. From the junction, its course is northwesterly into this State, across the southeasterly angle of Vermont. The remaining part of its course, which is sixteen or eighteen miles, is westerly, and is partly across the county of Washington, and partly across that of Rensellaer. After it has entered this State, it receives the

Walloomscoic from Vermont, and Little Hoosac from the interior of Rensellaer.

The Hoosac is about fifty miles in length. It is an impetuous stream, and liable to great and sudden elevation and depressions. The country through which it makes its way, is highly romantic and picturesque, now and then beautiful. The intervals along this river, have considerable extent and great fertility.

The next river which falls into the Hudson is the Mohawk. This river rises in the Highlands of Black river, in the southern part of the county of Lewis, not far from the source of Fish creek of Oneida lake, and takes a southeasterly course about twenty-eight miles, and then a southwesterly one about fourteen miles, to the village of Rome, in the county of Oneida, where it approaches within a mile of Wood creek, a water of Fish creek. Here it curves around to the east, and pursues an east southeasterly course to its mouths, at Waterford, Lansingburgh and Troy.

The Mohawk, a little before it mingles with the Hudson, separates into four branches. The upper enters at Waterford, and the lower nearly opposite the city of Troy. The others are intermediate. The distance between the mouths of the upper and lower branches is nearly four miles. Between these there are three islands. Haver island, which is about half a mile long, lies below Waterford, between the first and second branches. Van Schaick's island lies between the second and third branches, opposite Lansingburg. It is nearly two miles long, and half a mile broad. In 1777, the Northern Army, under Gen. Schuyler, took a position on this island just before it advanced to meet Gen. Burguoyne. Tibbet's island, between the third and fourth branches, has about the same extent.

The mouths of this river, the Dutch called the Spruyten, which we have changed into Sprouts.

The Mohawk traverses the counties of Oneida, Herkimer, Montgomery and Schenectady, and divides the counties of Albany and Saratoga. Its length from its source to its mouths, estimating it by its sinuosities, is little if any short of one

hundred and sixty miles, but in direct lines not much over one hundred and thirty. The upper and lower parts of this river are rapid and broken with cataracts. From Rome to Little Falls, it is a crooked dull stream. Between the foot of Little Falls, and the rapids below Schenectady, it is made up of reaches of slack water separated by rapids.

The Little Falls and the Cohoos are on this river, the former consists of two long rapids divided by a stretch of deep water. The whole descent is forty-two feet in three-quarters of a mile. The latter has a descent of seventy-eight feet. The water falls at an angle of about seventy degrees.

Before the construction of the Erie canal, this river, with a small swell, afforded good navigation for boats, carrying fifteen tons, from Schenectady to Rome, with the exception of Little Falls, and a rift at Germanflats.

The ascents and distances of this river, by actual admeasurments, made by the Hon. Benjamin Wright, and other engineers, employed in laying out and superintending the making of Erie canal, are as follows :—first, from tide water to the head of the Cohoos Falls, the ascent is 120 feet, and distance two miles —second, to the city of Schenectady 74 feet, and distance eighteen—third, to the foot of Little Falls 130 feet, and distance fifty-six—fourth, to the head of Little Falls 42 feet, and distance three-quarters—fifth, to the Rome summit level 54 feet, and distance thirty-eight. Total ascent 420 feet, and distance one hundred and fourteen miles and three-quarters.

The scenery along the Mohawk is often beautiful, not unfrequently picturesque, occasionally romantic. Its course from the vicinity of Utica is through a deep winding valley.

The Mohawk, we have already said, approaches within one mile of Wood creek. Its bed, at this approximation, is between nine and ten feet higher than that of Wood creek. Both streams have been united by a canal, so that boats passed and repassed from the Mohawk* to Oneida lake. In truth, the flat-

This river the Agoneaseah called *Can-ne-o-ga-ha-ka-lon-o-ni-tade;* also, Ye-no-na-natch (i. e.) going round a mountain. *See as to the latter, David Cusik's Sketches of the Six Nations.*

ness of the country is such, that the waters of the Mohawk, in very great floods, have been known to rise and spread over the lowest part of the level, and discharge themselves as well westwardly by Wood creek into Oneida lake, as eastwardly into the Hudson. The descent from the summit level into Oneida lake, is but sixty feet. The distance is about fourteen miles.

We shall take a brief notice of the streams that fall into the Mohawk.

They are Deerfield, Oriskinny and Sauquait, in the county of Oneida; Staring's, Myers', Steel's and West Canada creeks, in the county of Herkimer; East Canada, Caroga, Osquake, Canajoharie, Little Canada or Cayadutta, Schoharie and Choctononeda, in the county of Montgomery; and the Aelplas below Schenectady, near the Saratoga border.

Deerfield creek comes from the north and enters a little above the Orskinny. It is not over fourteen miles in length. Oriskinny enters on the south nine or ten miles east of Rome. It heads in the county of Madison, near the source of the Chenango, and pursues a north northeasterly course about twenty-five miles. Westmoreland creek falls into it.

The Sanquait, an inconsiderable stream, rises near the sources of Unadilla, a water of the Susquehannah, and flows north northwesterly sixteen or eighteen miles, where it mingles with the Mohawk, a little to the northeast of the village of Whitesborough; it is a beautiful stream, bordered by fertile lands.

Staring's creek, on the north, and Myers' and Steel's creeks on the south, are not over ten or twelve miles in length; Fulmer and Nowadaga are also on the south side.

West Canada creek heads among the mountains in the southwestern part of the county of Hamilton, very near the sources of the west branch of Sacondaga river, and takes a southwesterly course for about thirty-four miles, to the head of the celebrated Trenton Falls. Here it turns and takes a southerly course about three miles, inclining to the southwest. It then turns to the left and runs southeasterly about thirteen miles. After that, its course is southerly to its mouth, eight miles; its length is nearly sixty miles. From its source to the head of

Trenton Falls, it runs very nearly parallel with Black river, and at the variable distance of from four to eight miles. As far as Trenton Falls, its course is on the Highlands; it now flows through mountains and then through hills or across plains. Its current, thus far, is active with occasional exceptions; from the head to the foot of Trenton falls, upwards of two miles, it is one tremenduous torrent, abrupt precipices, and rugged crags present themselves on all sides, and the stream rushes with fearful impetuosity through a deep chasm. From the foot of the falls to its mouth it is in general a very rapid stream, but uninterrupted by cataracts. The country at the sources of West Canada creek, falls little, if any, under 1600 feet above the surface of the ocean. Black creek, enters West Canada creek, five miles above Trenton Falls, and Cincinati, about one mile below. In length these streams are not over twelve or fifteen miles. The Agoneasean name for this stream was Cayoharie.

East Canada creek, which falls into the Mohawk seven miles below Little Falls, likewise heads very near the west branch of Sacondaga river, in the county of Hamilton, seven or eight miles south of Lake Pleasant, and runs southwesterly about twenty-four miles, where it is joined by Spruce creek, from the northwest; the remaining part of its way is south; its entire course, by its bed, is about forty miles.

Spruce creek is about twenty miles long; both streams are extremely rapid. The bed of East Canada creek, in the two last miles of its course, sinks nearly 200 feet.

Caroga creek enters the Mohawk about seven miles east of the latter stream; it is eighteen or twenty miles long, and heads in the northern parts of the county of Montgomery, near some of the south branches of West Stony creek.

Osquake creek falls into the Mohawk on the south, a little east of Fort Plain; it is twelve or fourteen miles long, and is formed by three large springs, in the southwest part of the town of Starke. There are numerous petrifactions and tufaceous rocks in the upper part of the valley through which it directs its course. The waters of these springs are highly impregnated with the carbonate of lime.

Canajoharie* also enters on the south side, three or four miles eastwardly of the Osquake, after a course of about fifteen miles; in the last two or three miles of its course, it descends several hundred feet, forming in its way several cascades.

Cayadutta, or Little Canada, falls into the Mohawk, nearly a mile west of Caughnawaga, after a course of fifteen miles; it rises on the eastern declivity of Clip hill, or Clinton mountain, and passes by the village of Johnstown.

Schoharie creek, the largest vassal of the Mohawk, heads on the northern declivity of the Kaatskill† mountains, in the county of Green, near the sources of Kaater's-kill, a branch of Catskill creek, and after a course of seventy miles, empties at Fort Hunter,‡ eighteen or twenty miles west of the city of Schenectady. Its courses are first northwesterly about twenty-eight miles, and thence northerly; Brakabin and Cobuskill from the west, and Fox creek from the east, are the main streams that fall into it.

The Schoharie flows with an impetuous current through a deep winding valley; its rises and falls are very sudden.

Chuctononeda§ rises in the town of Providence, in the county of Saratoga, and takes a southwesterly course into Montgomery county; its entrance into the river is at Veddersburg, sixteen miles west of Schenectady. When it reaches the declivity of the Mohawk valley, it falls about 120 feet in eighty rods; in drouths it disappears in the fissures of the limestone rocks, at the foot of the declivity.

The Aelplas|| falls into the Mohawk about three miles below Schenectady, after a serpentine course of fifteen or sixteen miles; its origin is in Gallaway, county of Saratoga.

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* The pot or kettle that washes itself. On this stream, at the foot of one of its falls, there is a rocky basin which is kept clean by the circular motion of the waters; hence the name.

† The Kanjearagore of the Mohawks.

‡ The Icanderago of the Mohawks.

§ Chuctononeda, in the Aganuschionian tongue, signifies the ninth hill.

|| Aelplas is Dutch---Its signification is the place where Eels are taken.

Having described the Mohawk and its main branches, we shall resume the description of the other streams which descend into the Hudson.

Poestenkill, from the east, enters a little below the city of Troy, after a winding course of upwards of twenty miles. The depression of this stream, in the last two miles of its course, is between 2 and 300 feet. The High falls, near Troy, in freshets have a romantic appearance.

Norman's-kill is about twenty-five miles in length, and enters the Hudson two miles south of the city of Albany, its source is in a small pond situated in Duanesbush, in the southwest part of the county of Schenectady.

Kinderhook*, a considerable stream, discharges itself into the Hudson on its left bank, six miles north of the city of Hudson, after a course of about thirty-five miles; it heads in the town of Hancock, in the westerly part of Massachusetts, near the south branch of Hoosac river. Its direction is southwesterly, it crosses the southeasterly part of the county of Rensselaer, and the northwesterly part of the county of Columbia. New Lebanon pool, Klinekill and Claverack creeks fall into it; the latter is about thirty miles long, and constitutes nearly half of the stream at the union, four miles from its mouth.

Ancram rises in the eastern part of Columbia county, in the town of Hillsdale, and after a winding course of about thirty-four miles, falls into the Hudson nearly opposite to the mouth of Catskill; its course is first southwesterly, about twenty miles, and then westerly about fourteen; it crosses the boundary between Columbia and Dutchess counties three times.

Catskill, which enters on the west bank of the Hudson, nearly opposite to Ancram, heads in the county of Schoharie, in a marsh, situated on or near the summit of the mountain, bounding the Schoharie valley on the east, and descends southeasterly about thirty-five miles; Kaater's-kill† and several other small streams augment it; its course is mostly in Green county, the marsh is between 1,100 and 1,200 feet above tide water.

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* The Childrens hoo*k*. Dutch.

† Kaats*kill* is Dutch, and signifies Cats cree*k*—Kaaters-*k*ill means *he* Cats cree*k*.

Esopus creek falls into the Hudson nine or ten miles south of the Catskill, after a devious way of upwards of fifty miles: it rises in the northwestern part of the county of Ulster, among the Kaatskill mountains, near the head waters of Papacton, a main branch of Delaware river; its courses are northwest eight or ten miles, southeast twenty-three miles, and northeast about eighteen miles: it flows through nearly the whole county; its character, till it has reached the country, in the vicinity of the Hudson, is that of a mountain torrent. Sawkill falls into it about seven miles above its mouth.

The Wallkill, which next claims our attention, has its origin in the county of Sussex, in the State of New-Jersey, and runs north northeasterly, between seventy and eighty miles. Its mouth is about east of the village of Kingston, in Ulster county; after entering this State, it crosses the county of Orange, and penetrates Ulster.

Shawangunk, or Ridber's-kill, a branch of Wallkill, exceeds thirty miles in length: it heads on the confines of New-Jersey, and runs along the eastern foot of Shawangunk mountain, and parallel with the Wallkill, to the convergence.

Rundout* river, another branch of Wallkill, originates in the county of Sullivan, and descends southeasterly fifteen or twenty miles, where it is forced by the Shawangunk mountain into a northeasterly direction, which course it keeps till it joins the Wallkill. Part of the Hudson and Delaware canal is in the valleys of the Rundout and Wallkill.

The drowned lands are on the borders of Wallkill river. They are mostly reclaimed, and comprise nearly 50,000 acres of very valuable land. In the northern part of Orange the bed of this stream is broken by falls of 40 or 50 feet descent. The bones of the Mastodon have been found in these flat lands.

Wappinger's creek rises in the northeastern part of the county of Dutchess, in Stissin's Pond, and falls into the Hudson a little above the Highlands, or Matteawan mountains, after a serpentine course of nearly forty miles.

* Rundout is a corruption of the Dutch word for Redout. The early settlers from Holland erected a small fort on this river, which they called the Redout. Afterwards they applied the name to the stream.

Moordenar's, or Martler's-kill, is entirely in Orange county, and is about twenty-five miles in extent. It is very crooked.

Fishkill is about as long, and falls into the Hudson a little below Wappinger's creek, and on the same side.

Wappinger and Fishkill are in Dutchess county.

Croton discharges itself into the Hudson from the east, at the northern extremity of Tappan Bay. It rises on the western declivity of Taconic mountain, in the southeasterly part of Dutchess county. In its way to the Hudson it crosses Putman county diagonally, and passes through the northwestern part of Westchester county. Its length, by its sweeps and curves, is about forty miles.

After Croton river the Hudson receives no stream worthy of notice.

The Bronx, a small river of Westchester county, issues out of Rye Pond, and runs southerly about twenty-five miles, and falls into East River near Hell-gate.

Harlem river, or strait, is eight miles long. It extends from the Hudson to East River, and divides Westchester from Manhatten Island. In some places it is half a mile broad, while in others it is not over one hundred yards.

Hackensack heads in the county of Rockland, a few miles west of Haverstraw Bay, and after a southerly course of nearly forty miles, dilates in Newark Bay, in the State of New-Jersey. Its course is mostly in the latter State. The Newark marshes, or Salt Meadows as they are commonly called, border upon it and Passaick river. Sloops, and other small craft, navigate it about fifteen miles.

The Ramapough, or Ramapo, one of the main branches of Passaick river, rises in a small pond in the county of Orange. In its way it crosses the west angle of Rockland. Its entire course, in this State, by its bed, is about twenty-fives miles.

The Delaware has its source in a small pond, called Utsayantho, situated at the base of the principal ridge of the Kaatskill mountains, in the southern part of the county of Schoharie, and runs southwesterly through the county of Delaware, to the eastern bounds of the county of Broome, a distance of about

fifty miles. In its way it is enlarged by Little Delaware, and several other streams. Little Delaware comes from the northeast, and joins it at Delhi, after a course of eighteen miles. At Broome the Delaware makes a large sweep, and takes a southeasterly direction to the mouth of Neversink river, sixty miles. In this part of its way it constitutes the boundary between this State and Pennsylvania from north latitude forty-two. At the mouth of Neversink, it turns and flows southwesterly to the mouth of the Lehigh, a distance of about sixty miles. Here it changes its direction to the southeast, and pursues that course for forty miles, to Trenton, where it shifts its direction again to the southwest for about seventy miles. The remainder of its course, to the head of Delaware bay, is southeast.

The principal rivers and streams which fall into the Delaware river, are Papacton, Mongaup and Neversink, in this State; Lackawaxen, Broadhead, Lehigh, and Schuylkill, in Pennsylvania; Brandywine, in Delaware State; and Flatkill, Pawlinskill, Musconecunk, Pequest, and Anoocus, in the State of New-Jersey.

The Papacton is formed by the coalescence of two streams, called the North and East branches. The former rises on the northern borders of the county of Delaware, in the Kaatskill mountains, and the latter in the western part of the county of Ulster. At the coalescence neither exceeds twelve or fifteen miles in length. From thence, the Papacton pursues a southwesterly course to where it meets the Delaware. Its whole extent is nearly parallel with the parent stream. About nine miles before its entrance into Delaware river, it receives Beaver creek from the county of Sullivan. This stream is about thirty-five miles long by its windings.

Papacton has nearly its whole course in Delaware county, and is between fifty and sixty miles long.

Mongaup rises in the county of Sullivan, and takes a southeasterly course for twenty-five or thirty miles.

Neversink falls into the Delaware at the northwest angle of the State of New-Jersey. Its length, by its tortuous bed, is about sixty miles. It has its source in the county of Ulster,

and runs southeasterly through the county of Sullivan, and across the northwesterly corner of the county of Orange. Basler's-kill falls into Neversink about eight miles above its mouth, after a course of about eighteen miles, twelve of which are in the valley of Shawangunk. Its course, after entering the valley, is southwest. The Hudson and Delaware canal runs through the valleys of these streams for about twenty miles.

The Lackawaxen rises not far from the Lackawannock, a water of the Susquehannah, and runs in a general southeasterly direction upwards of forty miles. In the last twelve miles of its way, it is enlarged by the West and South branches. Its mouth is over against Lumberland, in the county of Sullivan. The Hudson and Delaware canal extends up the valley of this stream about twenty miles. The upper parts of the country through which the Lackawaxen flows, abound in coal of the kind called anthracite.

Broadhead is about thirty miles long.

The Lehigh rises in the county of Northampton, and after a devious course through the mountains, falls into the Delaware at Easton; its length is about one hundred and ten miles, it is boatable *from its mouth* upwardly, about thirty miles. Its sources are in a region abounding with coal.

The Schuylkill enters the Delaware five miles below the city of Philadelphia, in a straight line, but seven by the windings of the river. It is formed by the confluence of West Schuylkill and Little Schuylkill, about sixteen miles west of Reading. The former is twenty-eight miles, and the latter twenty-four miles in length, in straight lines. The general direction of the Schuylkill, from the confluence, is southeasterly—its head waters also rise in a region of coal.

The Brandywine enters Delaware river, about twenty-four miles below Philadelphia. Most of its course is in Pennsylvania—its length is between thirty and forty miles.

Flatkill is about twenty-five miles in length. It falls into the Delaware thirty miles below the Neversink, on the New-Jersey side.

Pawlin's-kill rises near Shawangunk, or Ridber's-kill, on the confines of New-York, and runs southwesterly nearly fifty miles, and enters below Flatkill.

Musconecunk falls in five or six miles below, after a winding course, which is southwesterly fifty miles.

Pequest, which enters six or seven miles lower down, is not over twenty-five miles in length—its course is southwesterly.

Ancocus river has its source in the county of Monmouth, and flows westerly about forty miles.

Delaware river is upwards of three hundred miles in length. The largest ships ascend it to Philadelphia, about fifty miles; sloops and schooners go up to Trenton, thirty-five miles higher. From thence it is navigable for boats, when swelled two or three feet, up to Delhi, in the county of Delaware, within twenty miles of its source. Arks, a temporary kind of craft, descend in freshets.

The descent of Delaware river, from its source to its mouth, is about 1,896 feet. At the mouth of Neversink, its surface at low water mark, is 460 feet above the tide waters of the Hudson.

The Delaware and Susquehannah rivers, near the Pennsylvania border, might be united by means of a canal, provided there was water: the distance, in a straight line, is only eight miles. A rail road may be substituted, which perhaps would answer every purpose. The distance from the Susquehannah, in the county of Broome, to the city of New-York, by the proposed rout, Delaware river, the Hudson and Delaware canal and Hudson's river, would not vary materially from two hundred and fifty miles; one hundred of which is composed of the navigable part of Hudson's river. Philadelphia is distant from the same place about two hundred and twelve, but the rout is far more difficult.

The entire basin of the Delaware embraces an area of about 13,000 square miles, but only 2,224 are in this State.

The Susquehannah, the second river, in a commercial view, in the State, issues out of Otsego lake, a beautiful expanse of

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Note.—The Lenni Lenape, called this river Chihohocki. The tribe Chihohocki lived on the west side, between the Lehigh and Duck creek.

water, nine miles long, situated in the northern part of the county of Otsego, and runs a southerly and southwesterly course, into the southeasterly part of the county of Broome, a distance of sixty-four miles, where it turns and flows southerly eleven miles, crossing the boundary into Pennsylvania; here it wheels to the right and takes a westerly and then a northwesterly course, eighteen or twenty miles, recrossing the boundary into this State, and forming what is called the Great Bend. It then changes its course and flows westwardly about twenty-four miles; and then southwestwardly about eighteen miles, and repasses the boundary for the last time. Thence, to the mouth of Tioga river, three or four miles, its course is southerly.

The Susquehannah, after its union with Tioga river, turns and pursues a southeasterly direction seventy miles, to the entrance of Lackawannock creek. Its direction then to the mouth of the West branch, sixty-five miles, is southwesterly. Below the mouth of the West branch its course is southerly, to the mouth of the Juniata, thirty-five miles. Immediately after the reception of this stream, it bends away to the southeast, and pursues that direction to its dilatation, into the head of Chesapeak Bay, about eighty miles.

The entire length of the Susquehannah, from its issue out of Otsego lake, to its mouth, computing it by its bed, is about four hundred miles. Its extreme sources are seven or eight miles north of the lake, and within seven miles of the Mohawk; these, including Otsego lake, would give an extent of four hundred and sixteen miles. In its passage from Otsego lake, it is increased by many rivers and streams. It is a broad shoal river, usually made up of long stretches of slack water and short rapids: It has no abrupt falls.

The country around the extreme sources of the Susquehannah, has an elevation of 1,400 or 1,500 feet above the surface of the ocean. This estimate is founded mainly on data, taken from canal surveys. The hills on the east and west sides of Otsego lake, are from 300 to 400 feet higher. Otsego lake is 1,198 feet above the level of the Atlantic Ocean.

We shall note its tributaries :—

Oke's creek, the outlet of Schuyler's lake, enters three miles below Otsego lake. It is from the west, and is eight or nine miles long.

Ten miles below the mouth of Oak creek, Sheneva creek enters from the east, after a course of about twenty miles.

Charlotte river rises in the town of Cobuskill, in the county of Schoharie, and runs southwesterly about thirty miles. Its entrance is on the left bank, eighteen miles below Otsego lake.

Otego creek rises in the town of Exeter, in the county of Otsego, and flows southerly about twenty-five miles, and enters on the right bank.

Ouleout creek is upwards of twenty miles in length, and runs southwesterly about twenty-five miles, and enters on the left bank.

The Unadilla* enters about twenty-three miles below the mouth of Charlotte, on the right bank. It rises in the town of Bridgewater, in the southeasterly corner of the county of Oneida, near the source of the Sauquait, and runs southerly nearly fifty miles. During its progress it is enlarged by several streams, such as Wharton's and Butternut creeks. The former joins it after a course of about twenty miles, and the latter after a course of about thirty miles. Both enter on its left bank.

The Unadilla is a beautiful stream, bounded by rich flats. It forms the division line between the counties of Otsego and Chenango.

The Chenango, a river of considerable magnitude and much beauty, has its source in the town of Smithfield, in the county of Madison, near the head waters of Oneida and Oriskinny creeks. It pursues, firstly, a southwesterly course about twenty-four miles, and then a southerly, and lastly, a southwesterly one of about fifty-six miles.

Ten miles before its entrance into the Susquehannah, it is joined by the Tioughnioga, sometimes called Onondaga river, from the northwest.

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* The Agoneasean name was Tianaderha. See Laws U. S. 1 vol. p. 315.

The Tioughnioga is upwards of fifty miles in length, and and is made by the union of two forks, denominated the north and the northeast. The former rises in the town of Tully, in the southern part of the county of Onondaga, and the latter in the southwestern part of the county of Madison. These forks meet at the town of Homer, in the county of Courtland. The general course of the Tioughnioga is southeasterly. It flows through the whole county of Courtland.

The Otselick, its main tributary, issues out of a pond in the town of Eaton, in the interior of the county of Madison, and flows southwesterly nearly forty miles, entering in Broome county. In its course it crosses the northwestern part of the county of Chenango, and the southeastern part of the county of Courtland.

The Chenango and Tioughnioga are navigable for boats, when swelled, the greater part of their courses.

Choconut and Nanticoke creeks fall into the Susquehannah, in the county of Broome. They are short streams.

The Owego takes its rise in the county of Courtland, and runs southwesterly thirty miles, forming in its way a part of the boundary between the counties of Broome and Tioga. A little above its mouth, it is joined by the Catetant, a stream from the north part of Tioga county, which is about twenty-five miles long.

The Chenango and Owego enter the Susquehannah on its right bank.

The Cayuta falls into the Susquehannah on the same bank, a little below the Pennsylvania boundary, after a south southeasterly course of thirty-four miles. Its source is near the head of Seneca lake.

The Tioga, sometimes called Chemug river, joins the Susquehannah four or five miles south of the boundary between this State and Pennsylvania. It is formed by two branches denominated the South and West branches. The South branch, by its windings, is fifty or sixty miles in length, and the West forty or fifty. The course of the South branch is northerly, and is about forty miles in a straight line. The West branch,

occasionally called Cawenisque, or Cawaniska, heads near the sources of the Genesee river, and runs eastwardly almost to the union, where it takes a northeasterly course, and crosses the boundary into this State. The union is a little north of the line. After the union, the united waters receive the name of Tioga river, and pursue a northerly course for seven or eight miles, where the Canisteo comes in from the west. Here the Tioga takes a northeasterly direction for three or four miles, when it is augmented by the Conhocton, or Cohocton. Immediately after the receipt of the Conhocton, the Tioga bends around to the southeast, and pursues that direction to its mouth, thirty-five miles.

Troup's creek heads in the southwest corner of the county of Steuben, and takes a northeasterly direction, inclining to the east about thirty miles, and falls into the Tioga about a mile above the mouth of the Canisteo.

The Canisteo takes its rise in the eastern part of the county of Alleghany, and flows southeasterly about fifty miles. It traverses the greater part of Steuben county. The Canisteo is navigable for boats and arks in spring and fall floods, thirty miles. Its common rises, in freshets, are between seven and eight feet. Shad and herring used to ascend this river. The flats which border it, are from half a mile to one mile broad.

Canicodeo, Bennet's, Steven's and Tuscarora creeks fall into the Canisteo.

The Conhocton heads in the county of Livingston, between Honeyoe and Hemlock lakes, and runs southeasterly nearly fifty miles in a direct course. It is navigable up to Bath, about twenty-four miles. Mud creek, and other streams, fall into it. The Conhocton is a fine river, bordered by rich lands.

Newton, Bush, Wynkoop's, and other creeks fall into the Tioga, below its coalescence with the Conhocton.

We shall take a rapid view of the streams that run into the Susquehannah, in Pennsylvania, below Tioga Point.

Sugar creek enters on the right bank, about nine miles below Tioga Point, after an easterly course of about twenty miles.

Tawanda also enters on the right bank, about five miles be-

low Sugar creek. Its length is about twenty-five miles, and its general course east northeasterly.

Wyahising enters fifteen or sixteen miles lower down on the left bank; its length is nearly thirty miles, and its course west southwesterly.

Tunckhannock has its rise near the Great Bend, and flows southerly and southwesterly upwards of thirty miles, and enters twenty-five miles below the Wyahising on the left bank.

Lackawannock river is about forty miles in length, and enters on the same bank about eighteen miles below the Tunckhannock; its directions are south and southwest. This river flows through a coal district; its course, from its source, for many miles, is nearly parallel with the Lackawaxen. Both rivers traverse portions of the same coal formation.

Nescopeck also enters on the same bank about thirty-five miles lower down—its course is about thirty miles.

Fishing creek, which is about as large as the Nescopeck, enters on the right bank about thirteen miles below; its courses are southeast, southwest, and east—its length is over thirty miles.

The West branch of Susquehannah unites eighteen or twenty miles below the preceding. It is constituted by the union of two streams, the south and north branches. The former rises near some of the waters of Conemaugh, a main branch of Kishkemanitas, and takes a northwesterly course, between forty and fifty miles, and then a northeasterly one for thirty or forty miles, where it is met by the latter. The second heads near some of the waters of Cononodaw, one of the chief branches of the Alleghany, and runs nearly southeasterly about forty miles, where it meets the west fork, which interlocks with Toby's creek. Here it turns and flows nearly in an easterly direction, sixteen miles, to its junction with the south branch.

The West branch, below the junction, pursues, firstly, a northeasterly direction about eleven miles; secondly, a southeasterly one about sixteen miles; thirdly, an easterly one for about forty-two miles; and fourthly, a southerly one for twenty-five or thirty miles. The chief streams that fall into it

are Bald Eagle, Pine, Lycoming and Loyalsock creeks, all of which deserve the name of rivers.

The West branch, computing its length by its flexures, does not vary much from two hundred miles; it is the largest stream that falls into the Susquehannah, its whole course, as well as those of its collaterals, is in a mountainous country. It, and its scattered branches, are boatable in freshets.

Six miles below the mouth of the West branch, Penn creek falls into the Susquehannah on its right bank, after an easterly course of about fifty miles.

Middle creek falls in on the same bank, a little below; its course is easterly, and its length about twenty-five miles.

Two miles below the mouth of Middle creek, the Mahony enters on the left bank; it is about thirty miles long, and its general course westerly.

The Juniata discharges itself into the Susquehannah, on its right bank, about twenty-three miles below the Mahony. This river has its source on the eastern declivity of the main ridge of the Alleghany mountains, near the head of Stony creek, a main branch of Conemaugh, and takes an easterly direction for about thirty miles, in a direct line, passing through Bedford, and receiving Danning's creek in its way. Soon after it has left Bedford, it turns short and pursues a northwesterly direction for eight miles, then a northwesterly one for about thirty-one miles, where it receives Little Juniata from the west. The latter is about forty miles long. After the reception, it runs southeasterly about ten miles; then northeasterly about twenty miles; and then east southeasterly nearly forty miles, where it is merged in the Susquehannah. The distances are computed in straight lines—it is boatable up to Bedford.

Auchwich and Tuscarora creeks enter on the right bank, below the junction, and are severally about thirty miles long.

The Juniata, by its numerous flexures, is nearly or quite two hundred miles long.

Conedogwinet enters the Susquehannah on its right bank, about ten miles below the mouth of Juniata; its direction is east northeasterly, about forty-seven miles in a straight line.

Shippensburg creek, which is almost as large as Conedogwinet enters on the same side, about five miles lower—its general direction is about east northeast.

Eight miles below the foregoing, Swatara falls in on the left bank, after a southwesterly course of about forty miles.

The Union canal, which unites the waters of the Susquehannah with those of the Schuylkill and Delaware rivers, commences at the mouth of this stream.

Conewago discharges itself on the right bank, five miles below Swatara; it has its rise in the northern part of the State of Maryland—its extent is about forty miles.

Codorus also rises in the State of Maryland, passes through Little York, and enters the right bank seven miles below Conewago.

Conestoga and Octorara enter on the left bank. The former passes east of the town of Lancaster, and is about forty miles long by its bed—the latter is less.

See Amos Lay's Map of the State of New-York, as to the courses and distances of the Susquehannah, and its tributaries.

The navigation of the Susquehannah, and some of its confluents, may be set down as follows:—

The waters of the Susquehannah, above the Conewago, when the river is low, flow upon an average, at the rate of about two miles an hour, and when swelled and high, about four, but from the head of Conewago Falls, to tide water, sixty or seventy miles, estimating the distance by its meanders, the average rapidity of the current is six miles at low water, and about ten or eleven at high; this being the usual progress of boats and arks descending the river. The annual freshets, suitable for ark navigation, usually occur in the months of February, March, April and May, and in October and November.

Arks and Durham boats are the only vessels used; the former carry from twenty to seventy tons, and draw from one foot eight inches, to two feet of water; the latter carry from twenty to forty tons, and draw from one to two feet. The arks are temporary craft, constructed solely for descending. The Durham

boats are used for ascending as well as descending; the latter, however, never go below Conewago Falls, because they could not be brought up except by warping.

The principal stream is navigable downwardly from Otsego lake for boats and arks. In the summer, when the river is low, the water between Owago in this State, and Harrisburg in Pennsylvania, is so clear that the bottom may almost every where be seen. From Owago to Nanticoke Falls, eight miles below Wilkesbarre, its waters glide smoothly along, often sluggish, sometimes accelerated over a gravelly, stony, or rocky bottom.

Nanticoke Falls, as they are denominated, is a strait or sluice, into which the whole stream is collected, and shoots down about five feet, in a distance of four hundred yards; these falls are not dangerous.

Nescopeck, or Berwick Falls, about twelve miles lower down, are similar: the water descends about six feet in three hundred yards. The ascent of these falls or rapids is attended with most difficulty in low water.

Mackee's Falls, nineteen miles below Northumberland, make a short rapid—they are easily passed and deemed safe.

Nine miles below Mackee's Falls, begin those ripples called Barger's, Berry's and Girty's Notch, which continue for nine miles. These ripples are formed by solid reefs of rocks, extending quite across the river; but with due attention there is no difficulty in passing them, either up or down.

Seven miles farther down Foster's Falls commence, and six miles lower, Hunter's; neither present a broken pitch. The stream, at these places, is much accelerated, and the channel, which passes among large masses of rocks that rise above the surface, or approach very near it, is crooked. Accidents rarely occur when boats and arks are passed by skillful pilots.

The descent and ascent of the few ripples from Hunter's Falls to Conewago, are attended with no difficulty or danger.

From Conewago, to tide water, at the embouchure of the river, sixty or seventy miles, is an almost uninterrupted rapid, the descent being about 272 feet. At Conewago Falls the water descends 19 feet in a quarter of a mile.

Boats and arks run from Columbia, a little below Conewago Falls, to tide water, in six or seven hours. The bed is narrow, deep, and very crooked. Boats never ascend this part of the river, in consequence of the great velocity of the water. They, however, ascend from Conewago, as far as Oquago, in the county of Broome, sixteen miles above Chenango Point, and Bath, on the Conhocton, in the county of Steuben.

The whole extent of the river, from the head of Conewago Falls to Otsego lake, might be ascended, provided the quantity of water was sufficient. The distance from Otsego lake to Owago, is one hundred and thirty-three miles, and the descent 400 feet, which is only three feet to the mile. From this point, down the stream, there is always water enough for boat navigation; but it is otherwise up the stream, since there is a gradual diminution. The navigation of this river is susceptible of vast improvements.

The entire basin of the Susquehannah is estimated to contain upwards of 20,000 square miles, with a population of 700,000 inhabitants. That part of the basin which is within this State, contains nearly six thousand square miles.

The commerce down the Susquehannah is already very considerable, and must annually increase with the growing population of the country.

The waters of the Susquehannah may be connected with the Erie canal and the Ohio river. A connection with the former would be highly advantageous to our citizens, and those of Pennsylvania. Large quantities of salt, gypsum, &c. would easily find their way into that State, where they might be exchanged for coal, iron, &c.

There are several coal formations within the basin of the Susquehannah.

That on the Susquehannah proper, according to Mr. Cist, extends in a southwesterly direction, from the upper part of the Lackawannock creek, near the Wayne county line, not far from Broome county, in this State, down the course of that creek, to its junction with the Susquehannah, keeping chiefly on the east side; leaving the river about eight miles below Wilkesbarre, it

passes in a southward course on to some branches of the Lehigh, a branch of the Delaware, and also on to the head waters of the Schuylkill; and thence, after crossing three main branches of the Schuylkill, becomes lost; a small seam of it only appearing at Peter's mountain, a few miles above Harrisburg, being upwards of one hundred miles in length, and several miles in breadth. On the height of land the veins of coal are more level than in the Wyoming valley, where the layers dip from the height of 500 feet, at an angle of from ten to thirty degrees towards the river. The coal alternates with shist, micaceous slate, and sand stone, which last is in strata, from 5 to 100 feet thick; the coal forming veins from 30 to 40 feet deep, though the general thickness is only from 12 to 15 feet. The coal is the kind called *anthracite*. It is good, and burns without smoke, and without emitting any unpleasant odour, and affords a very intense heat.

This remarkable coal field, according to an account published by Mr. J. Griscom, Professor of Chemistry in Columbia College, has an average width of three miles, and contains about 300 square miles. The thickness of the contiguous beds, he observes, in several places where the coal has been wrought, exceeds 30 feet; and it is well known from an example of a section, of the whole formation, in places where, by the disruption of the waters, the various beds are exposed, that the thickness of the several workable strata exceeds 45 feet; but assuming thirty as the medium thickness, the whole number of cubic yards, within the surface above specified, would be ten thousand millions. The specific gravity is about 1.47. A cubic yard weighs about 2,200 pounds, gross weight: hence, there will be ten thousand millions of tons weight, after allowing two hundred pounds for waste; supposing the strata continuous throughout. This, however, is not to be imagined, as the formation is in several places broken by ridges of highland; but supposing a deduction of one half be made, there will still remain five thousand millions of tons, a quantity sufficient to supply New-York, Philadelphia and Baltimore, supposing those cities to contain

eighty thousand houses, and each house to consume five tons in a year, during a period of 12,500 years.

It appears reasonable, therefore, to infer from data not unworthy of reliance, that the Wyoming and Lackawannock valleys contain a body of coal sufficient to supply all the wants of the eastern and middle sections of the United States, for a period which may be considered as indefenite.

The Alleghany, the principal branch of the Ohio, has its sources in the State of Pennsylvania, and is formed by the confluence of Cononodaw and Owago creeks. The former comes from the south, and the latter from the east, near the first fountains of Genesee river. These streams are severally from twenty-five to thirty miles in length at the confluence, a little north of latitude forty-two degrees. The Alleghany, for so the stream is called after the confluence, takes a northwesterly and westerly course for twenty-seven miles, when it turns, and flows southwesterly to the mouth of French creek, a distance of eighty or ninety miles. From thence, for thirty-eight miles, its course is southeasterly. Here it turns to the right, and rolls southwestwardly to Pittsburg, a distance about forty miles, where it is met by the Monongahela from Virginia. Thence to the Mississippi, the united stream assumes the name of Ohio.

The chief streams that fall into the Alleghany, are Olean, Great Valley, Kinzua, Conewango, Straw, French, Tanungwant, Toby, Sandylick, Pine, Crooked and Buffalo creeks, and Kishkemanitas river.

Olean rises in the northern part of the county of Cattaraugus, and descends southerly about thirty miles, and enters on the right bank.

Great Valley creek enters on the same bank, about sixteen miles below the mouth of Olean, after a course of twenty miles.

Kinzua enters on the left bank, after running a distance of twenty-five miles.

The Conowanga has its source in the northern part of Cattaraugus, and takes a southerly direction, inclining to the west, into the county of Chatauque, where it is met by the outlet of of Chatauque lake. After the meeting it flows southerly, cross-

ing the Pennsylvania boundary, and enters the Alleghany on its right bank. It is about fifty miles long. The meeting of this stream, and the outlet of Chatauque lake, is eighteen miles above its mouth.

Chatauque outlet, after its issue, is joined by Cosdaga outlet. Boats can ascend the Conewango and the outlets, quite into the lakes, and within seven miles of Lake Erie.

Straw creek takes its rise in the southern part of Chautauque county, and enters on the same bank. Its courses are south southeast and east.

French creek, a large branch of the Alleghany, heads in the town of Clymer, in the county of Chatauque, within ten miles of Lake Erie, and runs southwesterly across the northwest angle of Pennsylvania, where it receives Le Beuf. Its course, to its mouth, from this place, is southerly, inclining some to the southeast. It is boatable up to Le Beuf, seventy miles. Its mouth is about one hundred miles above Pittsburg.

Toby creek, another large branch of the Alleghany, flows between ninety and one hundred miles in a southwesterly direction, and enters on the left bank. Its source is near that of the Cononodaw.

Sandylick has a southwesterly course of about sixty miles. Its entrance is on the left bank, about twenty-four miles below Toby creek.

Pine, or Mahony creek, comes in on the same bank, after a course of upwards of forty miles.

Crooked creek likewise comes in on the same bank, after a course of nearly fifty miles.

The Kishkimanitas is about one hundred miles in length. This river is made by the junction of the river Conemaugh and Black-lick creek. The Kishkimanitas enters also on the left bank.

The length of the preceding streams is given with their windings. In direct lines they would fall considerably under our estimates.

The Alleghany is about two hundred and twenty-eight miles in length, computing it in direct lines, but by its various wind-

ings, about two hundred and seventy. About fifty miles of its course are in this State. This river, beginning about thirty miles below Olean, downwardly to the vicinity of Pittsburg, is bordered by steep hills which rise from two to six hundred feet. They are lowest towards Pittsburg. The bed of the stream is full of rocks, which it is supposed have rolled down from the neighbouring hills. The current is strong, and the boat navigation is attended with much difficulty unless the river is swelled. Spring and Autumn are the seasons when loaded boats go down. During July, August and September, and sometimes October, there is usually such a scarcity of water, that loaded boats can neither ascend nor descend.

The country from whence the Alleghany, and such of its confluents as have their sources in this State, must have an elevation of at least two thousand two hundred feet above the surface of the ocean. The descent from Olean to Pittsburg is estimated at between five and six hundred feet, which, upon an average, would be about two and a-half feet to the mile.

Before we take leave of the Alleghany, it may not be foreign to the subject, to briefly notice the Ohio, since it is merely a prolongation of the same river:—

The length of the Ohio, from Pittsburg to its entrance into the Mississippi, by its meanders, is nine hundred and fifty miles, but only five hundred and fifty in a direct line. It flows with a very gentle current, in a southwestwardly direction to its mouth, in north latitude thirty-seven degrees. It is a beautiful river. It is from four hundred to twelve hundred yards broad. In ordinary spring floods, it affords eighteen or twenty feet of water at Pittsburg, just below the junction: between Wheeling, ninety miles below Pittsburg, and Lewisville, from twenty-four to thirty feet; and from the foot of the rapids at Lewisville, to its mouth, from thirty to forty.

The rapids at Lewisville are two miles long, and have a descent of twenty-two feet. They are the only obstruction to boat navigation in low water. In floods ships of four or five hundred tons descend them.

The greatest elevations of the stream are in December, March, April, May and June, and the greatest depressions in August, September and October. At Pittsburg it is almost every winter frozen over for several weeks, and in some instances, for four hundred and fifty miles below. Generally, the navigation upwardly is suspended in consequence of floating ice, for eight or ten weeks every winter.

Its current, when of mean height, is estimated at three miles an hour; when higher and rising it is more, and when very low, about two miles.

The whole discent of the Ohio, from Pittsburg to its mouth, is estimated at 395 feet. This supposition is founded on various and pretty correct data. The average descent is five inches per mile. The surface of the Ohio, at Pittsburg, is 263 feet higher than Lake Erie, and about 830 above the tide waters of Chesapeake Bay.

That part of the valley of the Alleghany which is within this State, contains about 2,270 square miles.

We shall, in the next place, note the streams that fall into Lakes Erie and Ontario :—

Chautauque creek rises on the ridge of the same name, and descends northwesterly into Lake Erie. Its length is twelve or fourteen miles.

Canada-way, a mountain torrent, is fifteen miles long. Its source is in the county of Chautauque, near Cosdaga lake. In former times the Indigines used to carry their bark canoes from the boatable parts of this stream to Cosdaga lake, whose issue descends into the Alleghany by the Conewango.

The Chautauque, Canada-way, and other streams, which rise on the Chautauque ridge, have in their ways down its declivity, formed tremendous dells. These commence at the upper part of the declivity, and extend down to the foot, deepening and widening all the way.

Cattaraugus creek takes its rise in the southwestern part of the county of Genesee, and runs in a southwesterly direction about thirty miles, and then turns westerly, and soon after west northwesterly twenty miles, where it enters the lake. Its length

is fifty miles, and its mouth twenty-four miles south southwesterly from the village of Buffalo. It forms the division line between the counties of Erie and Cattaraugus. Boats and vessels drawing six feet of water enters its mouth.

Canquagua, or Eighteen Mile creek, enters the lake eighteen miles south southwesterly of Buffalo. Its course is west northwesterly twenty-five or thirty miles.

Buffalo* is formed by Cayuga and Seneca creeks, which unite seven or eight miles from its mouth. The former rises in Sheldon, in the county of Genesee, and takes a southwesterly course for about thirty miles.

The latter has its rise in the town of China, in the southwesterly part of the same county, and pursues a westerly course to the union, about thirty miles. Four miles below the union, Buffalo is enlarged by Cazenovia, which rises in the southeasterly part of the county of Erie, and runs northwesterly about twenty-eight miles.

Buffalo is navigable for boats to the union, eight miles. Within the bars at the village of Buffalo, there is a good harbour for lake vessels.

Tonnewanta† heads in the southern part of the county of Genesee, near the sources of Cattaraugus creek, and takes a northerly course to the vicinity of Batavia, a distance of twenty-five miles, where it turns to the west, and soon after to the northwest; and lastly, to the west, which latter direction it keeps to its entrance into Niagara river, opposite to Grand Island. It is about eighty miles in length, measuring it by its bed, which is very sinuous. The actual distance from its head to its mouth, in two straight lines, would not exceed fifty-five miles.

Tonnewanta has a breadth of from forty to fifty yards, for the last twenty miles of its course. With a small swell, boats of twelve or fifteen tons may ascend it about thirty miles, where its bed is broken by falls. It is a deep sluggish stream, having some diluvian bars. It forms the division line between Erie and Niagara counties, and ten or eleven miles of the Erie canal.

* The *Te-ho-se-ro-ron* of the Agoneaseah. *See U. S. laws, vol* 1 *p.* 307.

† The Agoneasean name is Tontewanta—The people now living in that part of the State call it by the Indian name.

Ellicot creek, a branch of Tonnewanta, rises in the western part of Genesee, and pursues a northwestern course for about thirty-five miles. Its entrance is just above the canal dam. In its descent from the upper to the middle plain, it forms a cascade.

Tonnewanta and Ellicot's creeks have tame banks.

Cascaw enters about twenty miles above Ellicot's creek, and on the same side. Its length is twenty-five miles, and its course north northwest.

The following streams fall into Lake Ontario:—

Tuscarora, after a northwesterly course of fifteen miles, enters a few miles east of Niagara.

Eighteen Mile creek falls into the lake, eighteen miles east of the mouth of the Niagara river. Its origin is on the middle plain, its general course is northerly, and its length, by its windings, about twenty-five miles. Small vessels, drawing five or six feet of water, occasionally enter its mouth.

Johnson's creek is eighteen miles long, by its bed—its course is northwesterly.

Oak Orchard* rises on the upper plain, and expands into Fish Bay, twenty miles east of Eighteen Mile creek. Its general course is northerly, but on the whole, very serpentine. It is about forty miles long, by its bed. On descending the steeps of the plains, it forms cascades.

Sandy creek, after a winding course of eighteen or twenty miles, falls into the lake, about nine miles east of Oak Orchard.

Salmon creek, of Lake Ontario, falls into Braddock's Bay. Its length is eighteen miles, and its course northeasterly. All of the preceding creeks have cascades where they descend from one plain to another.

Genesee river rises in the State of Pennsylvania, between the head waters of Owago, one of the branches of the Alleghany, and the head waters of Cawanisque, the west branch of Tioga, and runs northwesterly nearly fifty miles, where it changes its direction, and flows north northeasterly about sixty-three miles, and then enters Lake Ontario. Its entire length, by its tortuous bed, is about one hundred and fifty miles. Its course is

* Oak Orchard was called by the Agoneaseah, Kea-nau-hau-sent.

mostly in this State. After crossing the boundary, it passes through the counties of Alleghany, Livingston and Monroe, and crosses the southeasterly corner of Genesee.

The chief streams that empty their waters into it, are Canasaraga and Angellica creeks, Canesus and Honeoye outlets, Allen's and Black creeks.

Canasaraga heads in the county of Alleghany, and winds through parts of Steuben and Livingston, &c. Its length, by its bed, is not far from thirty miles.

Angellica has its origin in Steuben county, near the head waters of the Conhocton, and runs northwesterly, and enters in the town of Angellica, Livingston county.

Canesus outlet, a small stream, next enters.

Honeoye outlet, in its way to Genesee, is joined by the outlet of Hemlock lake—its length is about twenty-three miles, and its general direction northwesterly. The course of this stream is in the counties of Ontario, Munroe and Livingston.

Allen's creek heads in the southern part of the county of Genesee, and takes first a northerly and then an easterly course, inclining northeasterly, and falls into Genesee about eighteen miles southerly of Rochester. Its length, by its windings, exceeds fifty miles.

Black creek originates in the town of Stafford, in the county of Genesee, and pursues a northeasterly direction—its length is about twenty-five miles.

We shall note the ascents and navigation of Genesee river: from its mouth to the head of the upper falls, at Nunda, the ascent is estimated at about 520 feet. The data upon which this estimate is predicated, are as follow—First, from the mouth of the stream to the head of the rapids, at Rochester, 270 feet—second, from thence, up to the foot of the lower falls, at Nunda, 80 feet—third, to the head of the upper falls, withont including the rapids, 150 feet.

The falls at Carthage, five miles from the mouth of the river, have an abrupt descent of 106 feet, those just above 20 feet: those at the village of Rochester 97; the lower falls, at Nunda, 90 feet, and the upper 60.

Lake vessels, drawing eight or nine feet of water, ascend to Falltown, three miles and a-half. Batteaux, and other boats, with a swell, proceed from the feeder, which commences two miles above Rochester, to the foot of the falls at Nunda—the distance, by water, is between eighty and ninety miles; and by land about fifty. In a decreased state of the stream, boats only go up seventy miles.

The country, at the sources of the Genesee, has an elevation exceeding 2,300 feet above the ocean.

Irondequot takes its rise in the town of West Bloomfield, in the county of Ontario, and runs northerly into the head of Teoronto Bay. Its length is about twenty-miles—the canal crosses it on a lofty embankment.

Oswego river is formed by the junction of Seneca and Oneida rivers, at a place called Three River Point, in the town of Cicero, in the county of Onondaga, twenty-four miles south southeasterly from lake Ontario.

The Seneca is the principal branch. This river is formed by the union of Seneca and Canandaigua outlets, in the Montezuma marshes.

Seneca outlet issues out of Seneca lake, at its northeastern corner, and takes an east northeasterly course for thirteen miles, where it expands into the northern extremity of Cayuga lake. Then issuing out with the waters of Cayuga lake, it flows northerly to its union, five or six miles, with a very gentle current.

Canandaigua outlet, the other branch, issues out of the lake of the same name, and runs in a general northeasterly direction, to the village of Lyons, in the county of Wayne, where it is joined by Mud creek from the west.

This stream rises in the town of Naples, in the southwestern part of the county of Ontario, and runs northeasterly to the town of Palmyra, in Wayne county; and thence, eastwardly to its mouth. The whole length of this stream, by its windings, exceeds fifty miles.

From Lyons, Canandaigua outlet, or river, pursues an easterly course, to its union with Seneca outlet. Its length, from

its issue to its union, by its numerous windings, is about sixty miles. It is navigable for boats up to Lyons.

Flint creek, a small stream, falls into the Canandaigua at the hamlet of Vienna. Its source is in the county of Yates, and its course northerly.

Below the union, Seneca river flows northerly about five miles, where, after separating into two branches, which shortly afterwards rejoin, it bends around to the right, and pursues an easterly course, passing through the southerly end of Cross lake to the outlet of Onondaga lake, twenty-three miles in a straight line, but thirty-four by its sweeps and curves. Here it wheels to the left, and rolls north northwesterly, inclining to the north six miles, to its junction with Oneida river.

Seneca river, from the union to Three River Point, is a tame stream with low banks. It has no falls and but few rapids. Before the Erie canal was constructed, it afforded good navigation up to the union, and from thence, by its branches, up into Cayuga lake, on the one hand, and to Lyons on the other.

Seneca, in its way from the Montezuma marshes, to Three River Point, receives Owasco, Skaneatelis and Onondaga outlets.

Owasco outlet issues out of Owasco lake, lying in the interior of the county of Cayuga, and flowing in a northwesterly direction, thirteen miles, enters on the eastern border of the Montezuma marshes. Its descent is estimated at 300 feet.

Skaneatelis outlet issues out of the lake of the same name, lying in the western part of Onondaga, and pursuing a north northwesterly course for ten miles, falls into the Seneca a little west of Cross lake. Its descent is about 460 feet.

Onondaga outlet enters Seneca after a short course of about one hundred rods. It is artificial, the old drain having lately been shut up. Nine Mile, or Otisco and Onondaga creeks, which fall into Onondaga lake, furnish nearly all the water of the outlet.

Oneida river, or outlet, as it is sometimes called, the other branch of Otswego river, issues out of the west end of Oneida lake, and takes a westerly course, to its junction with Seneca river, making three large sweeps, besides several curves. The

distance from the issue to the junction, by the course it pursues, is about eighteen miles, but in a direct line not over nine. It is a dull stream with low banks. Its whole descent is twelve feet six inches.

Oneida lake, which gives origin to Oneida river, is the reservoir of several streams—we shall notice them.

Chitteningo enters the south side of the lake, seven miles east of the outlet. Its source is in Linklin's lake, in the western part of the county of Madison. After it has passed the village of Cazenovia, in the vicinity of the latter lake, its general direction is northwesterly. Canasaraga and Limestone creeks join it. Its length, by its flexures, exceeds thirty miles.

Oneida creek heads towards the central part of Madison county, near the sources of the Chenango, and runs eastwardly ten or twelve miles, and then northwesterly about fourteen miles, where it opens into the southeast corner of the lake. For fourteen miles it is the boundary between Madison and Oneida counties.

Fish creek, of Oneida lake, has its source in a small pond situated into the county of Lewis, a few miles west of Martin's-burg, near the head of the Mohawk. Its general course, to its disemboguement, is southerly. West Fish creek joins it seven or eight miles above its mouth, and Wood creek very near its entrance into the lake. The whole length of Fish creek, by its course, is fifty miles.

The Oswego, from the junction to the head of the falls, eleven or twelve miles, is a very gentle stream, but from thence to near its mouth, it is broken by falls and rapids. For its navigation we refer the reader to article *Canals*.

The Oswego drains an extent of country containing about 4,500 square miles.*

We shall subjoin a table of elevations:—

1st, The level at the junction, above the surface of Lake Ontario, is . . . . . 117 feet 6 inches.

* This river abounds with eels.—One thousand barrels have been taken in a season at the falls. Salmon, Bass, Pike, &c. are taken in great numbers.

2d, That of Oneida lake, is . . . . 130 feet.
3d, That of Onondaga lake, is . . . 124 do.
4th, That of Cayuga lake, is . . . . 150 do.
5th, That of Seneca lake, is . . . . 199 do.

Seneca and Oneida rivers usually rise in March and April, six or seven feet.

Note—From Montezuma, where Seneca and Cayuga and Canandaigua outlets unite to Three River Point, is thirty-eight miles according to a computation made by Mr. Giddes, and the descent twenty feet. The rise in Spring is much more in some places.

Little Salmon river enters Lake Ontario about seventeen miles easterly of the Oswego. Its source is near that of the West branch of Fish creek, and its direction northwesterly about twenty-five miles.

Big Salmon river falls into the lake four or five miles eastwardly of the preceding. It originates in the Highlands of Black river, near where Fish creek does. It, in the first place, runs northwesterly about fourteen miles; and in the second, westwardly about twenty-two miles. Most of its course is in Oswego county. The falls at Orwell, nearly midway between its source and mouth, have a perpendicular descent of 107 feet. Its mouth affords a tolerable harbour for vessels of fifty or sixty tons. It abounds with Salmon, Trout and Pickerel.

Little Sandy has its course and source in Oswego county. Its mouth is in a small lagoon, four or five miles north of that of Salmon river.

Big Sandy, which next enters Lake Ontario, has its source in the town of Denmark, in the county of Lewis, and runs in a westerly direction through the county of Jefferson. By its windings, its length is about thirty-five miles. A little above its mouth, Ellisburg creek joins it. Boats ascend about two miles. The mouth of Big Sandy opens into a lagoon—vessels drawing six or seven feet of water enter this stream.

Black river issues out of a small lake, situated in the uninhabited parts of the county of Herkimer, and runs southwesterly into the northeastern part of the county of Oneida, where it turns and takes a northwesterly direction, inclining some to the north, to the Great Bend. From thence, to its mouth, its di-

rection is westerly. Its first course is about twenty-eight miles, its second fifty-three, and its third twenty, all in direct lines. It crosses the county of Herkimer, winds across the northeasterly corner of Oneida, and passes through the counties of Lewis and Jefferson.

Black river opens into the head of Hungry Bay, four miles northeast of Sacketts Harbour.

The following streams are its tributaries :—

1st, Black creek, which falls into it on its left bank, near the confines of Herkimer and Oneida counties. Its course is westerly about twelve or fifteen miles.

2d, Moose river, which nearly equals it in size, enters on the right bank at the High Falls in Lewis county. Its source is in the county of Herkimer, and its course westerly. In its way it passes through several lakes and ponds. It is between thirty and forty miles in length.

3d, Otter creek enters on the same side, after a westerly course of twenty miles.

4th, Independence creek enters ten miles below the High Falls, after running westwardly twenty-five miles.

5th, Beaver river derives its sources in two small lakes, situated in the northeastern part of the county of Herkimer, near the head of the Oswegatchie, and runs westerly about thirty miles. Its entrance is also on the right bank.

5th, Deer creek comes from the southwest, and enters a few miles below Beaver river, on the left bank. Its bed is broken by cascades. The largest has a perpendicular descent of 170 feet. Deer creek is not much over twenty miles in length. Its course is in Lewis county.

Most of the streams which fall into Black river, are very precipitous. They are little else than mountain torrents.

Black river, for a considerable part of its way, flows through a deep valley. Its current is often accelerated, sometimes sluggish. Its bed is broken by the High Falls at Turin, in the county of Lewis, where its waters drop abrubtly 63 feet: By the Long Falls at Champion, in Jefferson county. The latter

consist of a series of rapids and cascades, which, together with several stretches of slack water, extend twelve miles. In the first two miles, it is computed that the water descends 60 feet. At the foot of these there is a smooth stretch of water for four miles, where other rapids occur for two miles, in which the descent is about 200 feet. Here a stretch of boatable water begins, which extends to the Great Bend, four miles. From this place to its mouth, it consists of reaches, rapids and falls. At Watertown there is a fall of 12 feet, and at Brownville another of about 24 feet. Black river is navigable for large boats, from the High Falls at Turin, to the head of the Long Falls at Wilna, forty-five miles. The whole of this distance is slack water or nearly such.

The region from whence this river derives its source, is nearly or quite 1,400 feet higher than the liquid plain of Lake Ontario.

Perch creek and Chaumont river are two small streams that fall into Chaumont Bay, a few miles north of the mouth of Black river. Both have their rises and courses in Jefferson county. They are severally eighteen miles in length.

Between Chaumont river and the outlet of Lake Ontario, there are no streams deserving of notice.

Mullet Otter Hyde Plesses and Crooked creeks fall into the St. Lawrence.

The Oswegatchie has its sources in three small lakes, situated in the north western part of the county of Hamilton, adjacent to those of Beaver river. Its general courses may be set down as follows :—First, northeasterly sixteen miles, to its dilatation in Cranberry lake—second, northwesterly to the Ox Bow, about forty miles—third, northeasterly to the natural canal, twenty-seven miles—and fourth, north northwesterly eleven miles, to its mouth at the village of Ogdensburg. From its source to its mouth, by its windings and turnings, it is about one hundred and twenty miles, but in a direct line not over sixty. At the west end of the Ox Bow it and Indian river approach within four miles of each other; they afterwards recede. At the natural canal it is only six miles from Grass river. The natural canal unites these streams. Nearly the whole course of Oswegatchie is in St.

Lawrence county. Its bed is broken by several falls and rapids. In general between these there are stretches of slack water. Boats ascend it to the falls at De Kalb, about forty-five miles.

The strip of land within the Ox Bow, is eight miles long and from one to two and three-quarters broad.

The natural canal is from five to ten rods broad, and has enough of water in freshets for loaded boats. The current sets in from Grass river. There is a descent of about four feet, which is eight inches to the mile.

The streams of most note which fall into Oswegatchie, are the West branch and Indian river.

The West branch rises in the north part of the county of Herkimer, and pursues a northwesterly direction thirteen miles, and then a northeasterly one seventeen. Its course is mostly in Lewis and St. Lawrence counties.

Indian river has its origin in the northeastern part of Lewis county, a little northwesterly of the sources of the West branch of Oswegatchie, and takes a northwesterly direction about seventeen miles, then a northeasterly one about five, then a southwestly one about six, then a northeasterly one about eight, then a southwesterly one about fifteen, and then a northeasterly one about twenty-three, where it opens into the southwesterly end of Black lake, a fine basin of water eighteen or twenty miles long. Then issuing out of the northeast end of this lake, in a fuller stream, it joins the Oswegatchie, after a progress of six miles. The junction is about six miles above Ogdensburg.

The course of Indian river is through parts of Lewis, Jefferson and St. Lawrence counties. It is a remarkably crooked stream. It nearly equals Oswegatchie at the coalescence.

The falls at Theresa are about 60 feet. Boats of ten or twelve tons go up as far as the cascade at Rossie, near the head of Black lake. From its mouth to its head, in a straight line, is about fifty miles.

About forty-one miles northeasterly from the mouth of Oswegatchie, Grass river enters the St. Lawrence. Its general directions is northeasterly. It heads near where the Oswegatchie does.

Its entire course is in St. Lawrence county, and is about one hundred and ten miles. It, like the preceding rivers, is very winding, especially in the upper part of its course.

The Oswegatchie, St. Lawrence, Grass and natural canal, form an island forty miles in length, and from one to eleven miles in breadth. The canal connects the first and third of these rivers.

The Racket issues out of a lake eight or nine miles long, and from two to three broad, situated in the northwestern part of the county of Hamilton, and runs easterly five miles, and *spreads* into a lake ten or eleven miles long, and one broad, stretching from northwest to southeast; then leaving this lake it takes a northeasterly direction eight or nine miles, crossing into the southwesterly part of Franklin, where it turns to the left, and pursues a westerly one about ten miles, and then enters Tupper's lake, lying in Franklin and St. Lawrence counties. On quiting this lake, it enters another after a northeasterly progress of two or three miles. After its departure from this lake, its course is northwesterly about thirty-five miles. The residue of its course, which is northeasterly, is about thirty-five miles. Its entrance into the St. Lawrence is about three miles below that of the Grass. From its mouth upwardly, till it has nearly transcended the sources of Grass and St. Regis rivers, its course is parallel with them. The entire length of the Racket, by its windings, is little, if any, under one hundred and sixty miles. It is navigable for small boats up to Lewisville, eighteen or twenty miles. From thence upwardly for thirty miles, its navigation is said to be interrupted by falls. Above these it is continued some distance. In Clarkham are falls which depress the bed in a short distance, nearly 200 feet. At its mouth it is about one hundred yards broad.

The Racket has its source in the elevated country between lakes Ontario and Champlain, and after the Hudson, has the greatest length and volume of water of any river having its origin in this part of the State. We are but little acquainted with the dreary and desolate region through which this river flows, before it reaches the low country neighbouring the St. Lawrence.

St. Regis has it entrance into the St. Lawrence about four miles below that of the Racket, and just after it has passed our northern boundary into the Province of Lower Canada. Its length is not far from eighty miles, reckoning it by the course which it pursues. Its sources are in some small ponds situated towards the southern part of the county of Franklin near Loon lake, from whence the Saranack flows. It proceeds northwesterly fifteen or twenty miles, where it is joined by the South branch, which heads in the same region. It still continues nearly in the same course, about twenty-five miles, when it turns and runs about twenty-four miles in a northeasterly one, receiving in its way the South branch, which is about forty miles long.

The St. Regis is one hundred and twenty yards broad at its mouth. It is a rapid stream, and affords no navigation for boats till near the St. Lawrence.

Salmon river is about fifty miles in length, and falls into the St. Lawrence a few miles beyond the boundary line. It is constituted by two small streams that issue out of two ponds situated not far from the head of the West branch of Saranack. Its direction is inclining some to the northwest. Boats carrying eight or ten tons, navigate it to French mills, nine or ten miles. Its course to the boundary is in the county of Franklin.

Trout river, an inconsiderable stream, falls into the St. Lawrence soon after it has passed our northern boundary. Its source is in the eastern part of the county of Franklin, near that of Big Chazy.

Chateaugua river opens into Lake St. Louis, a few miles above the town of Montreal. Its source is in Chateaugua lake, lying in the counties of Franklin and Clinton. Upon leaving the lake it runs north northwesterly about fifteen miles, and then northeasterly to its mouth. It has several cascades. The surface of Chateaugua lake is upwards of 1,200 feet above that of the ocean.

The Great Chazy heads in the Chateaugua mountains, in the eastern part of the county of Franklin, and runs northeasterly within three miles of latitude forty-five, which is our northern boundary, and then turns to the right and proceeds southeasterly

to its mouth, which is in Lake Champlain. Its length, in two direct lines, is about thirty-six miles, but by its windings upwards of fifty. Almost the whole course of this river is in the county of Clinton. Its mouth is about twelve miles south of the boundary.

The Little Chazy comes from the interior of the county of Clinton, and enters the same lake about three miles south of the Big Chazy.

The Saranack discharges itself into Lake Champlain at Plattsburg, thirteen miles south of the preceding, after running a course of more than sixty miles. About twenty miles from its mouth, it separates into two branches, called the West and South. The former rises in a small lake situated in the county of Franklin, and flows easterly upwards of twenty miles: the latter heads in Loon lake, in the same county, and passes through Saranack lake. On leaving it, it runs northeasterly about thirty miles, where it is met by the preceding. The courses given are direct. Both streams pass through Sable mountain.

Ten miles south of the mouth of Saranack, the river Sable commingles with Lake Champlain. Fifteen miles above its mouth it divides into two branches, denominated the West and South. The West issues out of a small lake lying in the northwestern part of the county of Essex, and proceeds northeasterly about twenty miles: the South originates in the town of Keen, in the same county, and also proceeds in a northeasterly course to the coalition, upwards of twenty miles. This river, from the coalition downwardly, is the line of division between the counties of Clinton and Essex.

Adgate's Falls are on the South fork. Just below the falls there is a narrow ravine. Its sides are composed of rocks which rise abruptly where the public road passes—the width is seventy feet, and the depth to the water, about ninety.

The Boquet enters Lake Champlain at Willsborough, in the county of Essex. This river is also formed by the coalition of two forks, the West and the South, which meet five or six miles above its mouth. Neither is over twenty-five miles in length. Boats ascend about two miles. Its course is wholly in Essex.

The next stream that calls our attention is the outlet of Lake George. It is only three or four miles long. Its entrance is at Ticonderoga, in the southeasterly corner of the county of Essex. In this short distance its bed has a depression of one hundred aud fifty-seven feet.

Wood creek, of Lake Champlain, enters at what is called the head of the lake. Its source is in French Pond. in the town of Queensbury, in the county of Warren, about three miles southeast of the head of Lake George. It flows southeasterly three or four miles, then northeasterly to near Fort Ann; and lastly, north northeasterly to its mouth. Its length, by its windings, is about twenty-five miles.

Pawlet river, which about equals it in size, joins it near its mouth. This stream rises in the town of Danby, in the State of Vermont. Its direction is northwesterly. The courses of Wood creek and Pawlet river are mostly in the county of Washington.

The Northern canal runs along Wood creek, and its southern branch, from White Hall, about eighteen miles.

Poultney river, sometimes denominated the East branch of Wood creek, likewise rises in Vermont, and after a serpentine direction of more than thirty miles, unites just below White Hall.

Lake Champlain, from the mouths of Wood creek and Poultney river, to Ticonderoga, is a mere strait. Nothing but the depth of water, and two small bays, called East and South bays, could ever have induced persons to dignify this part with the name of lake. In general its breadth does not greatly surpass that of a moderately sized river. To call it a river, to the vicinity of Ticonderoga, would not, in our opinion, be a perversion of terms.

The surface of Lake Champlain, at the mouth of Wood creek, is eighty-six feet higher than the tide water at Troy.

See Eddy's, Lay's and Vance's Maps, as to the courses and distances of our rivers, &c. The Maps of Eddy and Lay comprehend not only this State, but portions of the neighbouring States.

The St. Lawrence,* which washes the northwest side of this State, from the outlet of Lake Ontario, to latitude forty-five, a distance of one hundred and nine miles, for several considerations, merits our attention; but it would be a departure were we to enter into an ample description: we shall, therefore, confine our remarks mostly to it and its continuations, the Niagara, Detroit, and St. Clair, or Huron rivers. The commercial channels which they open, either directly or indirectly, to the people of this State, seem to require this.

The St. Lawrence issues out of the northeastern corner of Lake Ontario in two branches, and runs northeastwardly about six hundred and eighty miles, where it spreads into the Gulf of St. Lawrence. In its way it receives on its right bank Oswegatchie, Grass, Racket, St. Regis, Salmon, Trout and Chateaugua rivers, from this State; the Sorell, or Richelieu, which is common to this State and Vermont; St. Francis, from the latter State, and Chaudiere, from the State of Maine; and on its left Outawas, Masquinonge, St. Maurice, Seguenai, Black river, &c.

The St. Lawrence is a large, broad, deep river, embracing a multitude of islands, and opening a water communication between the Atlantic Ocean and the great lakes. Its navigation may be noted in the following manner:—first, ships of all descriptions ascend it to Quebec, three hundred and twenty miles—second, ships of five or six hundred tons burthen ascend to Montreal, one hundred and seventy miles farther—third, boats, and other craft, not drawing over seven or eight feet of water, proceed about forty miles higher, where rapids intervene—fourth, boats drawing two and a-half or three feet of water, advance to Ogdensburg, about ninety miles—fifth, sloops and schooners make their way from this place up to the lake, sixty miles. Montreal is at the head of ship navigation, and Ogdensburg at the foot of lake navigation. The tide reaches Trois Riviers, ninety miles above Quebec.

* The Agoneaseah called this river Canawage, also Cadaraqui.

The St. Lawrence is computed to be one hundred and five miles broad between Cape Rosiere and the Labrador shore, where it opens into the Gulf of St. Lawrence. Its width between Quebec and Montreal, and between the latter place and the Grand Sault, is from a mile and a-half, to four, and even twelve, as at St. Peter's, St. Louis, and Francis lakes.

The principal rapids are Grand Sault, Rapid Plat, Point Iroquois and Grand Gallop, or Gallop Islands—we shall notice some of the obstructions.

The first occurs three miles and three quarters above the mouth of St. Regis—here, for a distance of four hundred and forty yards, the velocity of the current is about five miles an hour.

The second is the strait separating Massena Point, from the head of Cornwall, a distance of eight hundred yards—the current runs through this strait at the rate of eight miles an hour.

The third begins about a mile and a-half higher up, and consists of a series of rapids, denominated the Long Sault.

The fourth begins at Point Ellicot, nine miles and three quarters above St. Regis, and extends upwardly about one mile; in this distance the water rushes through at the rate of eleven miles an hour.

The fifth are three miles and a quarter above the preceding, and are called La Grand Chute, and La Petit Chute—the latter is on the southeastern side of the river. These rapids are about eight hundred and ninety yards long; the water shoots through at the rate of sixteen miles and a-half an hour. These are considered the most difficult for boats.

The sixth rapid is at Store's Point—it is inconsiderable.

The seventh is Pepper Point, about seventeen miles above St. Regis—it is short, but the current is very swift.

The eighth is Rapid Plat, thirty-seven miles above St. Regis. It is strong.

The ninth is rapid au Gallop, a little higher up—it has great velocity, and is about two hundred and fifty yards long.

To ascend the foregoing, the boats have to be towed up.

Those employed between Montreal and Ogdensburg commonly carry thirty tons.

From Ogdensburg to Montreal the St. Lawrence consists of reaches of slack water and rapids. Lake St. Louis, on the southwest side of the island of Montreal, is sixteen miles in length, and from two to seven in breadth. Lake St. Francis begins at the mouth of Grass river, and ends a little above the Cedars, being about thirty eight miles long, and from two to six broad.

Between Ogdensburg and Lake Ontario the breadth fluctuates between one and eleven miles. The current, in this part of the river, is gentle.

The cluster of islands, denominated the Thousand Islands, is in this part of the river—some of these have extent, richness and beauty; while others are small, or consist of little else than piles of rocks.

The banks of the St. Lawrence, from Lake Ontario to Quebec, are in general low, and in some places swampy and marshy. No mountains occur in the vicinity of the river—the descent, from Lake Ontario to Three River Point, ninety miles below Montreal, is estimated at 231 feet—of this 200 feet are between Montreal and Lake Ontario.

The St. Lawrence, from its issue to its coalescence with Outawas, is a very uniform stream. Its volume of water is nearly the same during the year. Rains, the melting of the snow, and floods occasion very inconsiderable rises. The greatest elevation is about the last of June, and the greatest depression about the last of February. The elevation and depression are very gradual, the one commencing in March and the other in July. Apart from the rise and fall, which may be called annual, because they occur every year; there are other rises and falls which are occasioned by the winds—westerly and southwesterly winds drive the waters of Lake Ontario towards the east end, and about its drain, where they are heaped, and forced out in greater quantities—east and northeast winds have an opposite tendency. These drive them westwardly, and heap them about the west end, and occasion a lowering at the drain.

These rises and falls vary from one to three feet or more, according to the strength, rapidity, and continuance of the wind. The southwest and northeast cause the greatest elevations and depressions.

Should the question be asked, why the St. Lawrence does not rise and fall like other rivers: we answer, first, because the waters which supply it have to be diffused over the surfaces of five vast lakes before they can reach this river; second, because the surfaces have to be elevated before the rise can take effect; and third, because the waters, after they are diffused, drain off slowly, depressing all the surfaces at the same time. The Niagara, Detroit and Huron present the same phenomena in regard to rises and falls. Streams proceeding from lakes have much uniformity, especially if the lakes have considerable surfaces.

The Niagara issues out of the northeastern extremity of Lake Erie, at Black Rock, and runs northerly thirty-five miles, where it expands into Lake Ontario—in its way it forms several beautiful islands, and the celebrated falls of the same name—its length and descent, according to recent surveys, are as follow:—first, from Lake Erie to the head of the rapids, above the falls, the distance is twenty miles, and the descent fifteen feet—second, from the head of the rapids to the falls the distance is nearly a mile, and the descent fifty-one feet—third, the falls are 150 feet on the Canada side, and 164 on the New-York side—fourth, the distance to Lewistown, at the foot of the steep or heights, is seven miles, and the descent 104 feet—fifth, the distance from thence to the mouth of the river, is seven miles, and the descent two feet. The total descent is about 330 feet.

The banks from Black Rock to the falls are low, seldom exceeding eight or ten feet in height. The country, on all sides, exhibits an almost uniform plain, on which there is no hill to arrest the eye. About two miles above the falls the ancient banks are seen at a little distance from the present—they extend down the stream, and end at the chasm below the falls. They attain an elevation of seventy or eighty feet over against the cataracts, but this apparent elevation is simply the depression of the bed of the stream, in the last two miles. The descent of the

rapids is fifty-one feet, or according to some accounts, fifty-nine. From the falls to Lewistown, the banks are from 180 to 300 feet, of nearly perpendicular elevation, the plain still continuing to the brink of the steep at the latter place. Below Lewistown the banks are from twenty to thirty feet high.

The bed and banks of the Niagara are composed mostly of limestone, down to the falls—in many places the rock is covered with soil. Between the falls and Lewistown, the banks consist of limestone, slate and sandstone, lying upon each other in the order we have named them—the course of the river, originally, was across two plains, the upper and the lower—but owing to the wearing away of the rocks, it has sunk from 209 to 280 feet on the upper plain, and reaches the lower at its base.

The rapidity of the current at the issue, and for a mile and a-half below, upon an average, exceeds four miles an hour. In some part of this distance the velocity of the stream is at the rate of from six to seven miles an hour, in ordinary times—from the foot of this rapid, to near the head of the rapids above the falls, the current does not average two miles and a-half an hour. Between the falls and Lewistown, it runs at the rate of twelve miles—below the latter place, it is about three miles an hour.

Lake vessels now descend to Chippeway, and come up to Lewistown.

The annual rise is about three feet, and the depression about the same.

Niagara embosoms Squaw, Strawberry, Grand, Rattle Snake, Tonnawanta, Cayuga, Gill, Navy and Goat Islands. The first is at the lower end of the harbour of Black Rock, the second is between the latter and Grand Island, the fourth is between the latter and this State, the fifth is opposite the mouth of Tonnawanta creek, the sixth and seventh are between the latter creek and the rapids, above the falls, the eighth is near the lower end of Grand Island, and belongs to Upper Canada—Goat Island is at the falls.

Grand Island is twelve miles in length, and contains about 17,000 acres of land.

Tonnawanta creek, from this State and Chippeway, from Upper Canada, fall into the Niagara. The entrance of the former is opposite to Grand Island, and of the latter opposite to Navy Island.

Detroit river commences at the southwest extremity of Lake St Clair, and running six miles and an half, nearly in a southwest direction, passes the city of Detroit, in a channel three-fourths of a mile wide. Opposite to Detroit the river is narrower than it is in any other part of its course. Below the city the river winds three and an half miles southwest, to the river Rouge ; thence, turning to the south, it gradually widens, and in a distance of eighteen miles, disembogues into Lake Erie, by a mouth five miles broad. Vessels drawing seven or eight feet of water, pass without difficulty up the river into Lake St. Clair. It is a tranquil stream, with low banks—its course is through a champaign country—it embosoms several fine islands, such as Celeron, Gros, Bois Blanc, Grand, Petit, Turkey, Hog and Peach islands—these greatly enhance its beauty.

St. Clair river issues out of the southeast corner of Lake Huron, and flowing nearly south, twenty-six miles, opens by several mouths into Lake St. Clair, forming a kind of delta. It is, with the exception of the rapids at Fort Gratiot, a placid stream. Its usual breadth is about three quarters of a mile. The volume of water, in this river, as well as that in the Detroit, is pretty uniform, and its depth sufficient for such vessels as navigate the lakes. Lake St. Clair, which receives St. Clair river, and discharges Detroit, lies between the mouth of the former, and the issue or head of the latter.

The strait or issue of Lake Michigan, which is abont fifteen miles in length, communicates with Lake Huron at Mackinaw—it is also navigable for lake vessels.

St. Mary's river, which connects lakes Huron and Superior, is about forty-five miles in length, by its sinuous course—its navigation for vessels is obstructed by two rapids ; the first, or lower, called Nebish's rapid, has a descent of four feet ; the second, called Sault de St. Mary's, has a descent of nineteen

feet. These, however, are so gradual that boats drawing several feet of water ascend them.

The basin of the St. Lawrence extends from the mouth of the river to the head waters of Lake Superior, a distance of nearly 1,500 miles, in a direct line, with a mean width of nearly 400 miles, and contains about 500,000 square miles. In this estimate we include the five greater lakes, *to wit*, Ontario, Erie, Huron, Michigan and Superior.

Lake Ontario contains about 6,400 square miles, Erie about 8,500, Huron about 20,000, Michigan about 15,000, and Superior about 30,000. Ontario is elevated about 240 feet above the ocean—Erie about 575, Huron 600, Michigan rather more, and Superior 641.

CHAPTER VI.

LAKES, SEAS AND BAYS.

LAKE George is about thirty-four miles in length from south to north, and from one to four in breadth from east to west. It is a beautiful expanse of water. The Palmertown mountain is on the east side, and the Kayaderosseras on the west. These nearly environ it, and have elevations of from 700 to 1,200 feet above the surface of the ocean. Its head is only nine miles from Glen's Falls, on the Hudson, and its foot three from Ticonderoga, on Lake Champlain. It is situated in the counties of Washington, Warren and Essex, mostly, however, in the two former. Its surface is 243 feet above tide water at Troy, on the Hudson, and 157 above the surface of Lake Champlain. Its shores are bold and rocky. It contains upwards of three hundred islands. Many, however, are merely heaps of rocks. At its north end it communicates with Lake Champlain by a narrow strait. There are three falls besides rapids on the strait. Its waters teem with salmon trout, bass, and other delicious fish. In some places it is sixty fathoms deep.

The scenery around Lake George is exceedingly magnificent and picturesque. One of the best views of this lake and its environs, is from the high grounds near its head. Here the eye takes in about fourteen miles of its extent, together with many islands.

The aborigines called it "*Can-i-de-ri-oit*," that is, tail of the lake. Forts William, Henry and George, now in ruins, were at its head.

French Pond, in the town of Queensbury, in the county of Warren, is three miles long, and upwards of a mile broad. Wood creek rises in it.

Schroon lake, situated in a valley, nine or ten miles west of Lake George, is eight or nine miles in length, and one in breadth, stretching nearly from north to south. The river of the same name enters its north end, and passes out at its south. It is a fine basin of limpid water, and teems with fish. Kayaderosseras mountain lies between it and Lake George. The division line between Essex and Warren crosses it from east to west, nearly midway.

Loon lake, in the town of Chester, in the county of Warren, is two miles in length, and upwards of one in breadth. Its waters pass into Schroon river.

Friend's lake is in the same town, and is two miles long and half a mile wide.

Lake Paradox, in the town of Schroon, in the county of Essex, is about five miles long, and falls into Schroon river.

Brant lake is about as long, and passes into Schroon river. It is in the county of Warren.

Lake Saranack, out of which the river of that name issues, is in the town of Keen, in the northwestern part of the county of Essex. It is four or five miles long and two broad, and environed by mountains.

Lake Placid, in the same town, contains about 1,700 acres.

Loon lake, in the uninhabited wilds of the county of Franklin, situated two or three miles northwesterly from Lake Saranack, is about seven miles in length, and from one to two in breadth. Its outlet opens into the Saranack.

Tupper's lake, situated in the southern part of the county of St. Lawrence, is five or six miles long and one or two broad. Its outlet falls into the river Racket.

Cranbury lake, about fourteen miles west of Tupper's lake, is five or six miles long and one or two broad. Oswegatchie river passes through it.

Lake Racket, out of which Racket river issues, is eight or nine miles long, and from two to four broad. It is in the northwestern part of the county of Hamilton.

Hamilton lake, situated a few miles northeasterly of the latter, is ten or eleven miles long, and one or two broad. The Racket passes through it.

Pezeeko, a small lake in the town of Wells, in the same county, is five or six miles in circumference. It derived its name from an Indian who resided on its shores.

Lake Pleasant is also in the same county. It is three or four miles long, and one broad. Its drain enters Sacondaga river. It is about seven miles east of Pezeeko.

Caroga lake is about three miles in length. Caroga creek has its source in it. It is seven miles northwest of the village of Johnstown, in the county of Montgomery.

The lakes and ponds in the northern primitive tract, besides those enumerated, are very numerous and vary exceedingly in size. Some are eleven or twelve miles in length, and from one to four in breadth, while others scarcely contain one hundred acres. They occupy valleys and other low situations, and are disseminated over the whole country. In some parts the numbers are such that twenty may be seen from a single mountain or eminence. All these lakes and ponds communicate directly or indirectly with the Hudson and St. Lawrence, and with lakes Ontario and Champlain. Their waters are generally pure and limpid, and abound with salmon trout, trout, and other excellent fish. The salmon trout, in some of these lakes, weigh from three to thirty pounds. Hitherto, owing to the difficulty of access to these collections of water, the fish have not been much disturbed by anglers.

Saratoga lake, in the county of Saratoga, is eight miles long, and from two to three broad, stretching from south to north. It lies about eight miles west of Hudson's river, with which it communicates by means of Fish creek, its drain. There is a fine view of this lake, and the surrounding country, from the summit of Snake Hill, lying on its eastern shore. Nearly two-thirds of the borders of this lake are swampy and marshy.

Kayaderosseras creek opens into Saratoga lake, on the west side, not far from its outlet. There is considerable variety of fish in this lake. Before Hudson's river and Fish creek were obstructed with dams—great numbers of herring used to come annually into it. Its rise in the spring, is three or four feet.

Owl Pond, in the same county, about four miles southeasterly of Saratoga Springs, is two or three miles long. Its drain enters Kayaderosseras creek.

Ballston lake, in the towns of Ballston and Malta, in the same county, is nearly four miles in length, and about a quarter of a mile in breadth. Its drain enters Round lake. The adjacent country has a gently waving surface, and is highly beautiful.

Round lake is in the town of Malta, a few miles eastwardly of Ballston. Its circuit is about four miles. Its drain leads into the Hudson. The surface of the contiguous country is diversified with many hillocks which seem to have been tossed up by conflicting masses of water.

Big Pond is in the town of Argyle, Washington county. Its extent from northeast to southwest is three miles, and its breadth, in an opposite direction, one. Its outlet passes into Hudson's river.

Sand lake is one mile long. It is in the town of the same name, in Ransellaer county. Other ponds communicate with it.

Whiting's Pond, in the eastern part of Canaan, Columbia county, has a circuit of five miles. Its issue flows into the stream formed by Lebanon Pool, and thence into Kinderhook creek. At the north end of this pond, there is a marsh which has abundance of calcareous marl.

Fish Pond, on the east line of the town of Kinderhook, Columbia county, is four miles in circumference.

Charlotte, Chalk, Round, Indian and Great Pond, are in the county of Dutchess. These severally, contain about 300 acres.

Crum Pond, in Putnam county, is three miles long and one broad.

Mahopack Pond, in the same county, is about three miles round.

Peach Pond is two miles long, and one broad.

Rye Pond is in Westchester, and gives origin to the little river Bronx.

Ronconcoma Pond is in the town of Brookhaven, Suffolk county, Long Island. It comprises a circuit of three miles. It is girt about by a beach of white sand. Its waters are placid.

White lake is situated in the town of Bethel, Sullivan county. Its length and breadth are severally one mile.

Black lake and Great lake, two small collections of water, are situated in the same county.

Lake Maria, in the town of Duanesbush, in the county of Schenectady, is three miles in compass. Its situation is commanding. On one side the spectator has a view of the lofty Kaatskill, and on the other, of the Green mountains, while the intervening spaces lie as it were rolled out beneath his feet.

Lake Maria is on Flint Hill, an elongation of that branch of the Kaatskill, which is on the east side of Schoharie creek, and which we have called Kanjearagore.

Cromhorn Pond is in the town of Maryland, in the county of Otsego. Its circumference is three miles. It is on Cromhorn mountain, and is one of the most elevated expanses of water in the State. It is environed with thick dark shady groves which communicate a sombre to its crystal waters.

Otsego lake, a delightsome expanse of water, is situated in the county of the same name, at the northern extremity of the basin of the Susquehannah, between high hills. It is nine miles in length, from north to south, and from one to three miles in breadth, from east to west. Its surface is 1,197 feet higher than the surface of the Atlantic Ocean. The hill or mountain scenery is beautiful. Otsego lake gives origin to the Susquehannah river. It is replenished with water by several small streams and some springs. Bass, salmon trout, pike, pickerel, sun fish, &c. inhabit its transparent waters. The bass, in richness and delicacy of flavor, surpass all other fresh water fish in the State. Before the course of the Susquehannah was interrupted by mill-dams, shad and herring used to make their way up into this lake. Otsago is the Agoneasean name.

Schuyler's lake is in the same county, four or five miles northwest. It is five miles long, and from one to two broad, and

has an elevation not inferior to Otsego. Its issue descends into the Susquehannah. The hills around it are varied and beautiful. Perch, and other fine flavored fish, dwell in its pure waters.

The Agoneaseäh called it *Con-yagh-di-ra-go.* Parties of this people went every year from Nowadaga, &c. to its shores, for the purpose of hunting deer.

Linklaen's lake, in the town of Cazenovia, and county of Madison, is four miles in length, and about one in breadth. The Agoneaseah called it *Hawgena.* It is a handsome reservoir of water, environed by a gently waving country. Chittenango creek is its drain. Its surface is nearly 900 feet above that of the ocean.

Green Pond is in the town of Manlius, in the county of Onondaga. Its circuit is about three miles, and its elevation nearly or quite as great as that of Linklaen's lake. It is surrounded by high rocky and precipitous banks. Its waters have a beautiful sea-green colour, and are 200 feet deep.

Mud Pond is one mile in length, and half a mile in breadth. It is in the western part of the town of Onondaga. Its depth is so inconsiderable that it might be drained at a small expense.

Otisco lake, lying in the southern part of the county of Onondaga, is four miles long and one broad. Nine Mile creek, which falls into the west side of Onondaga lake, issues out of it at its north end. Otisco inlet enters its south end. Its surface is about 1000 feet above the tide waters of Hudson's river.

Skaneatelis is situated in the westerly part of the county of Onondaga, about eight or nine miles south of the Erie canal. Its length is fourteen miles, and its breadth from one to two. It stretches from south southeast to north northwest. Its outlet is at its northern extremity, and descends into Seneca river. The surface of this lake is about 840 feet above the ocean.

Skaneatelis is a handsome expanse of water. Its shores are bordered, in great part, with rich and well cultivated farms. The southerly half of this lake is bounded by hills, which have considerable elevation.

Owasco lake is in the county of Cayuga, nearly midway between Skaneatelis and Cayuga lakes. It extends from south to north, about eleven miles, inclining some to the northwest. Its breadth is from one to two miles. Owasco outlet, at its northerly end, is its drain. An inlet of the same name enters its head. The surrounding country is either hilly or moderately uneven. The surface of this lake is nearly 670 feet above tide water at Troy.

Cayuga lake, stretching nearly from south to north, is thirty-six miles long, and from one to four broad. Its outlet is about twenty-five miles south of lake Ontario. Its shores are often low, but not marshy, except about its issue. The country around its head is hilly, and towards its foot champaign. Its surface contains about eighty square miles. In some parts its waters are so deep that they are seldom closed with ice during the rigours of winter.

Several streams, such as Main inlet, Six Mile creek, Fall creek, and Salmon creek pour their waters into it.

Salmon, bass, pike, pickerel, trout, and other fish, are found in it in considerable numbers.

This lake, in its primitive state, extended northerly over the Montezuma marshes, and southerly over part of the vale of Ithica, and had an extent of about fifty miles. At present, during high spring floods, it rises and overspreads these marshes.

Senеca lake is thirty-three miles in length from south to north, and from two to four in breadth from east to west. It lies between seven and seventeen miles west of Cayuga lake. Its surface is sixty feet higher than that of Cayuga lake, and about 431 higher than the tide water of Hudson's river at Troy. It is one of the handsomest lakes in the Fredish States, or perhaps in the world. Its waters are deep and pure, and have a sea-green tint. It is open all the year. The outlet of Crooked lake, Cashong creek and Seneca inlet fall into it. Its superfices do not vary much from ninety square miles.

The country, except around its head, is beautifully variegated with gentle rises, plains of moderate extent, woods, lawns, and well cultivated farms. Its shores are mostly composed of

shistic rocks of a fragile texture. Its drain is at its northeast corner.

The waters of Seneca lake, like those of Cayuga, have receded in the lapse of time. This is manifested by an inspection of the country at its extremeties.

Crooked lake is situated in the counties of Steuben and Yates, a few miles westwardly of Seneca. It is about eighteen miles in length, and extends northwardly. Near its center it separates into two arms.

Its outlet is at the end of the eastern arm. It is 700 feet above tide water on Hudson's river, and 269 above Seneca lake. The adjacent country is considerably broken with hills.

Little lake and Mud lake, in the county of Steuben, are a few miles from Crooked lake, but they are too inconsiderabe to demand notice.

Canandaigua lake, lying about thirteen miles westwardly of Seneca lake, is fourteen miles in length from south southwest to north northeast, and from one to two in breadth. It discharges its waters at its northeastern end, by Canandaigua outlet or river. Its surface is 670 feet higher than the tide water of the Hudson. The lands around this lake are fertile, and the scenery varied and beautiful. A small stream enters its head, called its inlet.

Honeyoe lake is about five miles long, and one broad, lying from south to north—its outlet makes its way into Genesee river.

Caneadea is a little west, and is about three miles long, and half a mile broad.

Hemlock, which lies westerly of Caneadea, is about six miles long from south to north, and one or two broad—its issue joins that of Honeyoe.

Canesus, situated westwardly of Hemlock, is about seven miles in extent from south to north, and from one to two in breadth from east to west—its outlet runs into Genesee river.

These lakes are between Canandaigua lake and Genesee river. Their surfaces are lower than Canandaigua—the two first are in the county of Ontario, the others are in the county of Livingston.

Little lake, in the town of Perry, county of Genesee, is two miles long and half a mile broad.

Chatauque lake, in the county of the same name, is a fine sheet of water. It is sixteen miles in length, and from one to four in breadth—its extent is nearly from northwest to southeast. The northwest end of this lake is only seven miles from Lake Erie. Its outlet, which has the same name, is boatable into Conewango, and thence down to the Alleghany. Mayville, the shire town of the county, is near the lake's head, and distant from Portland, on Lake Erie, eight miles. The contiguous country is rich and beautiful. The lake's surface is about 1,400 feet above the ocean.

Cosdaga is in the same county, eight or nine miles north of Chautauque lake, and about seven miles southeast of Lake Erie. Its length is three miles and its breadth one—its outlet falls into that of Lake Chautauque. In swells it is navigable for boats. There is a portage, or carrying place, between its head and the boatable part of Canada-way, which discharges itself into Lake Erie—it was used by the Agoneaseah.

Limestone Pond, in the county of Cattaraugus, is about as large as Cosdaga—it is situated very nearly on the height of land between Cattaraugus creek and Alleghany river. Its drain makes its way into the former stream.

Cross lake is situated in the county of Onondaga, about eleven miles westwardly of Onondaga lake. Its extent, from north to south, is about five miles, and from east to west, about two. Seneca river, in its way from the Montezuma marshes to Three River Point, passes through its south end. Cross Lake is in the Seneca and Oneida vale—its surface is 370 feet above tide water at Troy. The country around this lake is low, flat and swampy.

Otter and Parker's Ponds are in the county of Cayuga, and in the same vale. They are small, and lie northwest of Cross lake.

Onondaga* lake is in the county of that name. It extends nearly from south southeast to north northwest six miles, and

* Gannentaha is the ancient name of the country around Onondaga lake.

has a breadth of one mile. Its shores are low, and in general swampy and marshy. The celebrated Saline Springs are around its head, in the marshy and swampy grounds—its surface is about 366 feet above the ocean. Onondaga and Nine Mile creeks fall into it. The former is about twenty miles long, and opens at its head; the latter, including Otisco inlet, is longer—its entrance is on the west side towards the outlet.

Onondaga lake is environed by a brim or rocky steep of sixty or seventy feet descent. The steep is from thirty to sixty rods from its shores, and is very abrupt. Between the brim and shore the waters are shoal. The issue of this lake enters Seneca river after a course of about one hundred rods—it is artificial—the old drain was closed in 1823, upon opening the new—the surface of the lake has been depressed by the new drain nearly two feet. The waters of this lake are joined to the Erie canal by the Oswego canal, commencing at Syracuse and ending at Oswego.

There are some fine views of this lake and the neighbouring parts. That from Onondaga hill, distant five or six miles, is perhaps the best. From this place we see the whole lake and adjacent country, together with the villages of Geddysburg, Syracuse, Salina and Liverpool, lying as it were beneath our feet.

Oneida lake is twenty-one miles in length, and from three to five in breadth, extending nearly from east to west—its shores are low, wet, swampy and marshy. The surrounding country, on all sides, has a similar character, and presents nearly a dead level. Chittiningo, Oneida, Fish and other creeks empty their waters into it. Its surface is about 376 feet higher than the ocean. The distance between its head and the Mohawk river, at Rome, in the county of Oneida, is about thirteen miles.

Its waters are stored with salmon, bass, pike, cat-fish (weighing from four to fifty pounds,) dace, suckers, perch, eels, &c.

Oneida lake contains between seventy and eighty square miles.

Cayuga, Cross, Onondaga and Oneida lakes are detached portions of a lake which once overspread the vale of Oneida

and Seneca. The latter was severed from Lake Ontario when its barrier on the St Lawrence sunk below the level of the ridge or spine, between the Oneida and Seneca vale and that lake. Two mounds, the one over the valley of Oswego river, and the other between Little Sodus bay and the Montezuma marshes, of sixty feet elevation, would, at this day, connect all these lakes, and diffuse the waters over most of the vale. The difference in the surfaces of these lakes is very inconsiderable. We shall set them down for the satisfaction of the reader. Oneida lake is 130 feet above the level of Lake Ontario, Onondaga lake is 124, and Cayuga 150. The greatest difference is 26 feet. The Erie canal is not 60 feet above Oneida lake. Almost the whole country from Oriskinny to the western side of the Montezuma marshes, is very nearly a level. Every thing announces the former existence of a lake, such as levels, swamps, marshes, morasses, &c.

Mary's lake, in the county of Oswego, is three miles in circuit. It is midway between Oneida lake and Lake Ontario, being about ten miles distant from both. Its position is on the height of land.

Fish Pond, also in the same county, is about two miles and a-half long, and nearly two broad. It is westwardly of Oswego falls. Its outlet enters the river two miles below.

Oswegatchie, or Black lake, is situated in the county of St. Lawrence, four or five miles southeasterly of the St. Lawrence. It extends nearly twenty miles from southwest to northeast, and has a breadth of from half a mile to two miles. Indian river enters at its head, and issues at its foot. The bordering country is champaign.

In the vicinity of Oswegatchie lake, there is a group of ponds and small lakes, exceeding twenty in number. They communicate with St. Lawrence, Oswegatchie and Indian rivers, and Oswegatchie lake.

Having described the principal lakes and ponds which lie within the State, we shall proceed to a description of such as adjoin it:—

Lake Ontario,* the lowest of the five great lakes, is about one hundred and eighty miles in length, and from twenty to fifty-five miles in breadth. It extends nearly from west to east, and is partly in this State, and partly in the Province of Upper Canada. The boundary line passes through it from the mouth of Niagara river, to its outlet at the head of the Thousand Islands. It is a beautiful inland sea, of pure fresh water. Its shores are low, but not marshy or swampy. The contiguous country is either flat or very gently rolling. Its brim comes up almost to its shores. The water within the brim, in many places, is 500 feet deep. The navigation is good, and not attended with those dangers incidental to the other great lakes.

Niagara, Genesee, Oswego, Big Salmon and Black rivers enter on its south and east sides. Trent river falls into the head of the bay of Quinty.

The Niagara, owing to its enormous volume of water, and its rapidity, forms a current for many miles after its entrance. This is very obvious when it discharges the ice of Lake Erie, particularly in calms. The discharge continues from one to two months, and is usually in April and May. Partial discharges occur in the early part of winter, and in February and March. In May the discharge is so great that the coast eastwardly from the river for thirty miles, is literally covered with loose buoyant ice.

Lake Ontario has several spacious bays and fine harbours. We shall enumerate them.

Chaumont bay is at the east end of the lake, in the county of Jefferson. Strictly speaking, it consists of three branches. Henderson's bay, Hungry bay and Chaumont bay. Sackett's Harbour is formed by Hungry bay, lying to the north and northeast of the village, and Henderson's bay, lying to the southwest. The former ends in the mouth of Black river, and is five miles long, and from one to two broad. The latter is almost as large. Both unite westwardly of the village, and these again with Chaumont bay, and constitute a grand basin, covered by the Galoes and Stony islands, seven or eight miles

* The Agoneaseah called this lake *Oswego*. *See* 1 *vol. U. S. laws, p.* 307.

distant. Two passages, the west and north, lead out of the harbour into the lake. Ships of the largest dimensions anchor at the village, within a few rods of the shore, and are perfectly secure from winds.

Chaumont bay is north of Hungry bay. It is very capacious, embracing a circuit of twenty miles and upwards, and admits all kinds of vessels.

Kingston harbour, in Upper Canada, is on the north branch of the issue of Lake Ontario. The Main is on the north, and Grand Island on the south. It is very secure, and allows an ingress and egress to large ships.

The bay of Quinty, in the same Province, is fifty-five miles long, and from two to five broad. Point Peninsula lies between it and the lake. The entrance is near Kingston. There are several harbours in this bay.

Little York harbour, or Teoronto, on the north side of the lake, nearly opposite to the embouchure of the Niagara, is six miles long, and extends from southwest to northeast. A low strip of land, projecting into the lake, forms the southeast side of the bay. The water is shoal towards and around its head. It is not a very good harbour.

Burlington bay, at the head of the lake, is seven miles long, and five broad. Its form is somewhat triangular. It is joined to the lake by a small strait.

Niagara river affords a convenient harbour. It has three fathoms of water over the bar at its disemboguement.

Genesee and Oswego rivers have eight or nine feet of water at their mouths, and admit ordinary lake vessels.

Teoronto, or Irondequot bay, four miles and a-half east of Genesee river, has seven or eight feet of water over its bar.

Great Sodus bay, in Wayne county, twenty-seven miles east of the preceding, has about eight feet of water at its mouth.

Fish, Braddock's, and Little Sodus bays have each six or seven feet of water.

Lake Ontario contains several islands which are situated mostly around its outlet and along its east end—we shall do nothing more than name them. They are, Simco, Tonte, Quinty,

Grenadier and Stony islands, the Galoes, Fox islands and Duck islands.

The superfices of this lake, we have estimated at 6,400 square miles.

The surface of Lake Ontario is not near so large or high as it was in its primitive state. This is demonstrated by certain remains of its ancient shores which have withstood the levelling hand of time. Of these remains the ridge road, or beach, is the most entire. It commences on the borders of the Niagara river, at the village of Lewistown, and extends eastwardly of Big Sodus bay, a distance of one hundred and fifteen, or twenty miles, by its windings. It is distant from four to seven miles from the lake's present shore. Its course is parallel with the lake coast. It is from five to twenty-five feet high, and from four to one hundred rods broad, and even more in some places; it is about one hundred and thirty feet higher than the surface of the lake. The intervening space is a plain, with a gradual slope down to the shore. Portions of the same beach have been traced eastwardly to Oswego river.

These remains or beaches, are composed of loam, sand, gravel and pebbles, and some rounded stones, (water worn stones) evidently heaped by the waves. In some places there are two declivities, while in others there is only one. The declivity towards the lake is the longest, the most abrupt, and the best defined. On the opposite side, where the declivity is wanting, we generally find swamps and marshes. The surface of this beach is decomposed—within pebbles and stones are found. Its elevation appears very uniform. Its components differ from those of the soil on which it rests. At every stream it is interrupted, ending on the brink of the ravine on one side, and beginning on the brink on the other side. The beds of the streams, from the ridge, down to the lake, have been formed since the retreat of the waters. When Lake Ontario came up to the foot of the beach, and when its waves rolled in and dashed against it, it must have stretched across the ravines at times, very much in the same manner that the small beaches do now at the mouths of those streams, on the prevalence of certain winds.

The retrocession of the waters of the primitive lake corresponded with the lowering of the issue or drain above Ogdensburg. As this sunk the surface subsided. The sinking and subsidance in all probability were gradual.

Lake Erie,* the second of the great lakes, is two hundred and seventy-five miles long and forty broad, and is situated between forty-one and forty-three degrees of north latitude. It lies in the States of New-York, Pennsylvania and Ohio, the Territory of Michigan and the Province of Upper Canada. Its form is oval. It extends from southwest to northeast. Niagara river connects it with Lake Ontario, and Detroit river with Lake St. Clair. The country around this lake is either plain or champaign, except on the southeast, where the Chautauque hills rise at a little distance. Its shores are low, a few places excepted, and often wet and swampy.

Note.—In giving the length, breadth, and superfices of this lake, the reader will find that these fall greatly under those heretofore given by authors, *&c.* This course, however, we deemed necessary in order to correct errors which have been copied for ages.

Erie, in general, is not deep. Two hundred feet is the greatest depth yet found. The water along its coasts, and in certain places, some way out, are so shoal that the bottom may be seen. During severe winters it shuts entirely up. In general it is not wholly freed of ice before the middle of May. Its navigation is commonly suspended from the fifteenth of November, to the latter end of April, or the middle of May, every year.

In the southwestern part of the lake there are several small islands.

The first are called the Bass islands, and are seven in number. The three largest lie nearly north and south of each other, and are severally two miles and an half long, and half a mile wide. On the northside of the southernmost is the commodious harbour of Put-in-bay.

The Hen and Chickens are four very small islands, lying near each other, six or seven miles northwest of the Bass islands. They serve as land marks.

* The Agoneaseah anciently called this lake Kau-ha-gwa-rah-ka, i. e. a Cap: and latterly Erie, Erige or Erike, which, according to Hennepin signifies Cat's eye.

Long Point, a low narrow strip of land, projects from the Canada side, easterly into the lake, about twenty-three miles. It is opposite to the Pennsylvania triangle, and sixty miles southwesterly of Buffalo. A narrow isthmus joins it to the main.

Point au Plait, on the same side, nearly over against Sandusky bay, extends southeasterly into the lake twelve or thirteen miles.

Lake Erie has few or no good harbours. Buffalo, at its outlet, has seven or eight feet of water over the bar.

Cattaraugus creek has about four feet of water on the bar at its mouth.

Dunkirk, in the county of Chatauque, forty-five miles southwesterly of Buffalo, admits vessels drawing six or seven feet. Its entrance is crossed by a rocky bar.

Presque Isle, now called Erie, in the northwest corner of Pennsylvania, is eight or nine miles long, and from one to three broad, stretching from north to south. It has two openings into the lake. The one has been formed within a few years, by the encroachment of the lake. Vessels enter it by the southern opening. There are eight or nine feet of water over the bar. It is ninety-six miles southwest of Buffalo.

The mouths of Cayahoga and Rocky rivers admit vessels at times. They are in the State of Ohio.

Sandusky bay is entirely within the same State. It is twenty miles in length, and from three to four in breadth. It stretches in a west and east direction, and communicates with the lake by a narrow strait at its easterly extremity. A low strip of land of a peninsular form, lies between it and the lake. There are seven or eight feet of water over the bars at its mouth.

Maumee bay, at the southwestern extremity of the lake, formed in part by the dilatation of Maumee river, is about eight miles long and three broad, with seven feet of water over the bars. At the mouth of this bay there is an island three-fourths of a mile long, in the form of a crescent. Maumee bay is in the Territory of Michigan.

Detroit river, at its embouchure, makes a pretty good harbour.

Grand river, or the Ouse, on the northwest side of the lake, about twenty-five miles above its issue, has eight feet of water over the bars at its mouth. The Welland canal, now constructing, commences here.

Niagara river affords a harbour in storms. The rapidity of its current prevented its being used till lately, except in cases of necessity. Vessels now descending the rapids are passed up through the lock at the lower end of the harbour of Black Rock.

All the bays and rivers belonging to this lake have bars at their entrences. Most are subject to temporary obstructions.

The following rivers fall into Lake Erie, exclusive of Detroit river, and Cattaraugus and Buffalo creeks: *to wit*, the Raisin and Maumee, from Michigan; Carrying, Sandusky, Huron, Vermillion, Black, Rocky, Cuyahoga, Chagrine, Grand, Ashtabula and Conneaught, from Ohio; and Ouse from Upper Canada.

Lake Erie occupies a commanding position. Its extremities communicate with the Erie canal and Lakes Huron and Michigan, while its extended sides open avenues to the fertile regions situated around it. In a century from now, when those regions will be well peopled and cultivated, its waters will be whitened with canvass, wafting the products to Buffalo, and other places, around its outlet.

Lake Erie contains about 8,500 square miles.

Lake St. Clair is nearly midway between Lakes Erie and Huron, and forms the link between Detroit and Huron rivers. It is about twenty-five miles long and eighteen or twenty broad. Huron river opens into it by several mouths, and Detroit river issues out of it.

Huron, from Michigan, and De Trench, from Upper Canada, fall into Lake St. Clair.

Lake Huron is almost nine hundred miles in circumference. Its shape is nearly triangular. Huron river, its issue, leaves it at its southeastern angle. St. Mary's river, the issue of Lake Superior, enters at its western angle. According to recent estimates

its surface contains 20,000 square miles.* Huron is situated between forty-three degrees and thirty minutes, and forty-six degrees of north latitude. St. Mary's river, and the outlet of lake Michigan connect it with Superior and Michigan lakes.

Lake Michigan communicates with Huron, by the straits of Michilimackinack, fifteen miles long. It is between forty-one degrees, forty minutes, and forty-five of north latitude. Its length is about 232† miles from south to north.

The streams falling into it interlock with Ouisconsin and Illinois, which enter the Mississippi, and with some of the streams that fall into the Wabash.

Lake Ontario is about 230 feet above the tide waters of the Hudson. Lake Erie is 334 above the latter. Huron and Michigan are estimated to be about 30 higher than Erie.

Lake Champlain is mostly in this State and Vermont. It is one hundred and ten miles long, computing its extent from the head of South bay, in the county of Washington, to La Cole's mill's, in Lower Canada, a little beyond latitude forty-five. Its breadth is from a quarter of a mile to twelve or thirteen miles. The broadest part is between Peru, in the county of Essex, and the village of Burlington, in Vermont, and the narrowest between Ticonderoga and South bay. Its surface is estimated at 440‡ square miles. It stretches from south to north. The Sorell issues out of its north end, and falls into the St. Lawrence, forty-five miles below the town of Montreal, in Lower Canada. Vessels of eighty or ninety tons burthen navigate its whole extent, including portions of its inlet and outlet. St. John's and White Hall are at the extremes of its navigation.

The navigation is interrupted by the ice four or five months in the year. It usually shuts up in December and opens in March, or the forepart of April.

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* The superfices of this lake, we suspect, are overrated.

† Computed from its latitude.

‡ The estimated superfices of this lake have hitherto been greatly overrated.—The same may be said of those of lakes Ontario and Erie. The navigable part of the Hudson has also been overrated at least fifteen miles. The distanee from New-York to Albany, on the west side of that river, by actual measurement, is only 145 miles and some rods. The distance, by the latitude, is ten less. The length of lake Champlain, as well as the Hudson, was originally computed by the progress of vessels, a very uncertain mode of determning distances.

Lake Champlain contains several islands, such as Valcour and Schuyler islands, belonging to this State, and the two Heroes and La Motte, belonging to Vermont.

Valcour is on the coast of the county of Clinton, nearly equidistant between the mouths of Saranack and Sable rivers. Its extent from south to north is three or four miles, and its breadth one.

Schuyler's island is about five miles southerly, and has an extent of two miles.

The North Hero is eleven or twelve miles long and two broad.

The South Hero is thirteen miles long and from two to four broad. The Heroes are separated by a strait.

La Motte is six miles long and from one to two broad.

These islands are east of Clinton county.

Bays.—These are East and South bays at its head, Peru bay, Northwest bay, Cumberland bay, and Point au Ter bay, all in this State, and Burlington and Missisco bays in Vermont. East bay is four miles long, and nearly a mile broad where broadest. Poultney river and Wood creek open into it. It is mostly in Washington county.

South bay, in the same county, a few miles westwardly, is seven miles long and one broad.

Cumberland bay, in the county of Clinton, is three or four miles long and two or three broad. Saranack river enters its head—Plattsburgh is west of this bay.

Burlington bay, in Vermont, is five miles long and from one to two broad—its entrance is about a mile wide—the bay runs nearly from south to north.

Missisco bay is about twelve miles in length and from two to four and upwards in breadth—its form is very irregular.

The streams of most note, falling into Lake Champlain, are Wood creek, the outlet of Lake George, Boquet, Sable, Saranack and the Big Chazy, from this State, and Lamoille and Onion rivers, and Otter creek, from Vermont. Poultney is common to both States.

The country around Lake Champlain exhibits a very diver-

sified aspect. Between South bay and Ticonderoga, it is mountainous on both sides. From thence to near the borders of Clinton, it is mountainous on the west side, and hilly on the east. Here levels begin which extend northwardly into Canada.

Lake Champlain has an elevation of between ninety and one hundred feet above the ocean. The difference between the level of its surface, and that of tide water at Troy, on the Hudson, is eighty-six feet. Its waters yearly rise from four to six feet. The rise commonly commences about the middle of March, and continues to increase to the first or middle of June, after which there is a gradual decrease.

Lake Champlain, taken in connection with the Northern canal and the Sorell, forms a very important chain of water communication between the navigable parts of the Hudson and St. Lawrence rivers—the uninterrupted extent is 260 miles.

Its waters are stored with salmon, pike, pickerel, bass, salmon trout, yellow and white perch, sturgeon, shiners, chub, dace, trout, suckers, eels, &c.

Like many other lakes, Champlain has decreased both in extent and elevation. Its ancient shores are yet visible in many places, and are thirty, forty, and even fifty feet higher than its present. Fossil shells, and the trunks of trees are found buried fifteen or twenty feet beneath the surface, in the vicinity of its shores, and thence back two or three miles. In the flat country the soil is often alluvial, and bears the appearance of having been recently formed.

SEAS, BAYS, &c.

The Alantic Ocean washes the southeasterly part of this State. Long Island, Staten Island, &c. are embosomed in it.

Long Island Sound, a kind of inland sea, commences at Montauk Point, at the east end of the island, and extends westwardly, inclining to the southwest, to near Hell-Gate, where it contracts into a narrow strait, called East River. It is rather over one hundred miles in length, and has a breadth of from three to twenty-four miles. The broadest part is opposite New-

Haven, in Connecticut—it lies between Long Island and Connecticut—its shores are generally rocky and abound with little bays, inlets and coves.

East River, a contraction of the Sound, is about thirteen miles long, with a medial breadth of one mile. Its shores are bounded by granitic rocks. It separates Long Island from Westchester county and Manhattan Island. Hell-Gate,* a narrow crooked and dangerous pass is on this river, eight miles northeasterly of the City of New-York. The water, when the tide is rising and falling, rushes through with great velocity, forming in its way several cataracts and vortices which would swallow up or dash to pieces the largest ship were it to come within their reach. The best times for passing it are at high and low water. East River unites with the Hudson at the southwesterly end of Manhattan Island. The Mohiccons had a tradition, that in ancient times, their progenitors could cross Hell-Gate by stepping from rock to rock.

New-York bay is a mere dilatation of Hudson and East rivers. It is eight miles long, and from one to four broad, stretching southwardly from the city of New-York to the termination of the Narrows, between Long Island and Staten Island. Arthur-kull sound, lying between Bergen Point, in New-Jersey, and Staten Island, joins it to Newark bay. It has Long Island on the east—Staten Island, Arthur-kull sound, and Bergen Point on the west; these form its sides—the City of New-York and the mouths of the rivers are on the north, and Sandy Hook bay on the south. It is a beautiful sheet of water, diversified with several small islands, such as Govornor's, Bedlow's, Ellis and Gibbet's islands.

New-York bay affords a sufficient depth of water for the largest ships. It is a very safe and secure harbour, and is rarely obstructed with ice.

Newark bay, which is connected with New-York bay by Arthur-kull sound, is six miles long, and one or two broad. Hackensack and Passaick rivers open into its head. It extends

* *Het Helle Gat*, that is Hell Gut, or the Gut of Hell. This is the literal translation of the Dutch words.

from northeast to southwest, and narrows into Staten Island sound. Newark bay is mostly in New-Jersey.

*Arthur-kull sound is three miles in length, and from half a mile, to one mile or upwards in breadth. Staten Island lies south of it. Small vessels navigate it.

Staten Island sound begins at the foot of Newark bay, and ends in Amboy bay. It is about twelve miles long, with a breadth of from half a mile to one mile. Its course is from northeast to southwest, inclining some to the south. It divides Staten Island from New-Jersey.

Sandy Hook bay is in New-Jersey, and is about five miles in length from northwest to southeast, and five broad at its mouth. Its form is somewhat triangular. A narrow strip of land divides it from the ocean. Sandy Hook Light-house is at the northern extremity of this point of land, and is eight miles and a-half south southeasterly from the Narrows, and seventeen from the City of New-York, and about in the same direction. The Highlands of Neversink, about five miles south southeast of the Light-house, are the first lands seen from the ocean. Point Comfort is six miles west of the Light-house. Romer Shoals are about one mile north, and extend northerly almost two miles and a-half, with a breadth of from a mile to a mile and three-quarters. They have not depth of water for sloops. The ship channel is between Sandy Hook Light-house and these shoals. Ships, after they have passed the Light-house, turned the Point and entered the bay, are secure from all winds but the northwest. The bottom is free from rocks, and the anchorage good. Small craft, and ordinary vessels, may pass to the north of Romer's Shoals.

†Amboy bay is northwest of Sandy Hook bay. It is eight or nine miles long from west to east, and about five miles broad, where it opens into Sandy Hook bay. Its termination, on the west, is Rariton river and Staten Island strait. It is nearly triangular. Staten Island constitutes one of its sides, New-Jersey another, and the ocean the third.

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*Arthur kull is derived from Achter Cul, the Dutch name.

† Amboy is derived from the Lenni-Lenape word, Ambo, signifying a point

Great kills, on the southeast side of Staten Island, is an inlet of Amboy bay. It is nearly two miles long, and one broad at its opening.

Sandy Hook bay, Amboy bay, and the Narrows, open into each other, and these again into the ocean. The three ought to be called Sandy Hook bay, since they, in fact, constitute but a single expanse of water. The three, including the opening into the ocean, have a circuit of about forty-four miles, exclusive of coves, indentations, &c. and form an irregular triangle. The head of Amboy bay is at one angle, the Narrows at another, and the head of Sandy Hook,* at the third.

Staten Island is on one side, the coast of New-Jersey on another, and Sandy Hook point, the entrance of the ocean, Coney and Long Island, are on a third.

Gardner's bay, at the east end of Long Island, extends west southwestwardly about twenty-eight miles. It is twelve miles broad at its entrance, but narrows down to less than a mile, and ends in Peconick inlet. Properly speaking, it is divided into two bays, Gardner's bay and Peconick bay. Large ships navigate Gardner's bay, but Peconick bay only allows small vessels. Sagg Harbour is near the head of Gardner's bay, and is a commodious station for ships.

Gardner's bay contains Shelter island, Little Hog Neck island, and Robins island. Gardner's island is at the entrance, and extends nearly lengthwise across its mouth. It is seven miles long and from one to three broad. Plumb island is three miles long and one broad. It is distant from the preceding about two miles.

Shelter island is six miles long and five broad where broadest.

Gardner's bay has from five to ten fathoms of water. A strait nearly two miles broad lies between it and Peconick bay.

Peconick bay is twelve miles long, and from three to five broad.

Huntington, Cold Spring, Hamsted, Cow, Frog and Flushing bays are on the north side of the island. Jamaica bay is on the south side, in King's and Queen's counties.

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* The Dutch called Sandy Hook, *Sandt Punt*, also *Sandt Heeck*.

CHAPTER VII.

CANALS.

THE banks of rivers, and the shores of lakes, seas and oceans, were first frequented by men in the earliest periods of society. Then a tree, a raft, or the hollow trunk of a tree, served for vehicles to pass rivers, lakes and bays. Between then and the time when ships were constructed, an immense period must have elapsed. The substitution of a canoe for a raft or float, of the latter for a boat with sails and a mast, and this again for a decked vessel, were all great improvements, and the works of countless ages. A great difference must be seen in each advance, but how vast is that between the raft and ship. The one is an essay in the very infancy of society, the other is an accomplishment in its manhood. Floats, rafts and canoes were the highest attainments of man, in the savage state. The aborigines of this continent, the savages of Africa, Asia, New-Holland, and the islands in the Pacific Ocean, have advanced no farther. Man, even after he had quitted this state and cultivated the ground, still used the canoe. But in the lapse of time, as society expanded and the useful arts came into existance, his views expanded. His occupations became more varied. Agriculture advanced, manufactories sprung up, these begat commerce. Men travelled from home, to dispose of their surplus commodities. At first the journies were short, being from town to town, or from one small community or state to another. These were made by land. By and by distant places attracted notice. These were visited, but the journies became more tedious, and more difficult. Recourse was had to water conveyance, but this had its disadvantages. Few commodities could be transported in a canoe. It afforded no shelter from the inclemency of the weather. The mind of man being ever elastic, and always intent on something

new, sought out improvements. A boat, a vessel of larger dimensions, and constructed of pieces of wood, and partly decked or covered, occurred to his mind. This was one advance from a canoe towards a ship. Longer and more difficult voyages could be performed in this species of vessel, and more commodities carried than in the canoe. Afterwards the single mast was erected and hung with canvass, perhaps with the skins of beasts. This was spread before the wind, in order to aid the oars and propel the vessel. The single mast and the single sail were followed by double masts and double sails; to these succeeded triple masts, many sails, and whole decked vessels. Then oars were abandoned in the management of a ship.

As society advanced, and as improvements were made, (for men seldom retrograde,) it became necessary to drain the waters from some lands, and to prevent inundations on others. At first small ditches were drawn, with easy declivities, to carry off the water, and embankments were raised to keep off inundations. These processes were at first carried on, upon small scales, on the borders of small streams, or at some distance from large ones. Presently the ditches were lengthened, widened and deepened; the embankments were also extended and enlarged. By and by canals succeeded these ditches, and even small rivers. These were used by boats. Such seems to have been the origin of canals. At first a simple ditch, then a canal, and lastly, an artificial river. Whoever considers the subject will readily perceive this. The simple drain, or ditch, bears the same analogy to a canal that a canoe does to a ship. Both are the infantile efforts of society.

The ancient Egyptians inhabited the country along the Nile. This river, at present, after entering Egypt, receives no accessions. Egypt has no brooks, no rivers, no streams, but the Nile. There nature does not moisten and steepen the earth with rains, as she does with us, but contents herself with permitting the Nile to overspread its banks once a-year. Vegetation therefore, in that country, does not, as it does with us, depend on rains and copious dews, but upon the moisture which the earth imbibes, at these annual overflowings. In that country,

we first hear of canals. Ancient historians speak of them with admiration, but all they say is general. They have mentioned no particulars. These canals were constructed at a very early period, in the history of that country, for the purpose of draining the lands, carrying off the waters of the inundation, and for the purpose of spreading them to a greater distance. Embankments were also raised for the retention, exclusion and diffusion of the waters. By these embankments the waters were separated into fields, the one rising above another, or one having a different level from another. These were connected by canals, gates and sluices, and the waters were carried from level to level. By these means large tracts of land were put under tillage, which had formerly been wastes. Upon the retiring of the waters, within the banks, the inhabitants of one city or village, visited those of another in boats, which navigated these canals. Every section of Egypt abounded with these useful structures. The inhabitants of distant parts, by means of these and the river, could visit one another, and interchange their commodities.

About six hundred and sixteen years before the Christian era, according to Herodotus, the Egyptians under Necos, made a canal from the Nile to the Red Sea. It is said to have been one hundred cubits broad. The Macedonian Kings of Egypt, and after them the Emperors of Rome, repaired it. Owing, however, to the revolutions, which have happened in that ill-fated country, this splendid work has disappeared long ago.

The Chinese seem to have been acquainted with canals, at a very early period. About two centuries before our era, mention is made of their constructing canals. Since then great attention has been paid in that empire to this subject. No country, at this day, has so many canals and upon so large a scale. Some resemble rivers. The Grand Canal is upwards of nine hundred miles in length, and from one hundred to two hundred feet in breadth. The Chinese canals are made upon inclined plains, and have no locks.

In Hindostan, canals are of very ancient date. The countries along the Indus, the Ganges, the Godavery, the Kistna, the Nerbudda, &c. are filled with canals. Some have considerable

length, and are extensively used for commercial purposes. There are many other parts of Hindostan which have canals. In some instances, they extend from one river to another. The Hindoo canals are often used for irrigation, as well as navigation.

In Europe, canals may be dated back to the time of the Romans. We read of the Pontine and other canals. The Roman canals were not numerous, nor considerable as to extent. The conquest of that people, by the barbarians, and the destruction of their empire, suspended internal improvements.

Between the eleventh and sixteenth centuries, the Italians made some progress in the structure of canals. Their first essays were directed to the draining of the marshes along the Po, and around its mouths. Hitherto canals have not been constructed upon a large scale in this country. None of the Italian canals is over forty miles in length. The divided state of the country has opposed formidable obstacles to great national improvements—the Italians are supposed to have invented locks.

In Holland, a country mostly conquered from the ocean and Rhine, canals and embankments may be carried back to the time of the Roman conquest. Of their progress and extent, very little is known before the tenth century. Since then the Dutch have been at infinite pains in constructing canals and raising embankments. Every part of their country abounds with these useful structures—Holland may be said to be a country of canals and dykes.

Belgium, which borders on Holland, has also many canals—in both countries canals have been subservient to commercial purposes, time out of mind. Holland owes her existence to embankments and canals—without these she would be a quagmire.

In the seventeenth century the French turned their attention to canals. Louis Fourteenth caused the canal of Languedoc to be made—it is one hundred and forty-eight miles long. Fourteen years were spent in constructing it. Its breadth, at the surface, is sixty-four feet, and its depth about six feet. Boats of one hundred tons navigate it. The structure of the Languedoc

canal, has rendered this monarch more famous than all his victories. There are several other canals in France, but they have less extent.

The subjects of the Prussian monarchy, have paid some attention to canals.

During the reign of the Emperor Peter the First, the Russians then just emerging from the barbarous state, embarked in canals. The canal of Ladoga is the longest—it is a work worthy of its illustrious projector.

The canal of Kiel, in Holstein, is twenty-two miles long, and has a depth of ten feet of water—it admits vessels of one hundred and twenty tons. Its extensions are about twenty-eight miles, making in all about fifty miles—it is a Danish work.

The English, the most renowned among the commercial nations of modern time, paid very little attention to canals before the year 1755 or 1756. About this time the Duke of Bridgewater began a canal, which he completed at his own expense. The extent of this canal is inconsiderable—the singular and unexpected success of this enlightened and enterprising individual, induced others to embark in similar enterprises. Since then the English have constructed many canals—at present, the length of the different canals in Great Britain and Ireland exceed three thousand miles. England is so intersected with canals, that boats traverse the kingdom, in almost all directions—most of her inland towns are transformed, as it were, to the shores of the seas, which nearly surround her.

Having taken a rapid view of the origin and progress of canals in Africa, Asia and Europe, we shall direct our attention to canals in America. Very soon after the termination of the revolutionary war, the views of certain individuals, in several of the United States, were directed towards canals, and other internal improvements. It is not our intention to go over all the States—Massachusetts, the cradle of our independence, has the merit of having opened the way, in large enterprises of this nature. The Middlesex canal is twenty-seven miles long, and connects the tide water in Boston harbour, at Charlestown, with the Merrimack river. The water in the canal is thirty feet

wide at its surface, twenty feet at its bottom, and three feet deep. The Concord, or Sudbury river, crosses the line of the canal on the summit level, twenty-two miles from Charlestown, and five miles from the junction of the canal, with Merrimack river, and supplies it with water for locking down each way—from tide water to the summit level, there is an ascent of one hundred and four feet, and from thence to the Merrimack, a descent of thirty-two feet. There are in all twenty locks, which are severally seventy-five feet long in the clear, and eleven feet in width. Boats carrying fourteen tons, and drawn by a single horse, move at the rate of three miles an hour—the towing path is eight feet broad. This canal was commenced in 1790, and opened for use in 1804. The levels were taken by Mr. Weston, whom we shall have occasion hereafter to mention, as concerned in New-York. Its cost exceeded five hundred thousand dollars. The natural obstacles were formidable.

In New-York, Major General Phillip Schuyler seems to have been the first who originated canals. On the fifteenth day of February, 1791, a committee from the senate and assembly were appointed to enquire what obstructions there were in the Hudson and Mohawk rivers, and how they might be removed—General Schuyler was on this committee.

The American people seem never to have duly appreciated the talents and merits of General Schuyler. To this distinguished man we owe the capture of Burgoyne, and the saving of states, then bursting into existence. He is the General who obstructed the enemy in his march, re-organized the defeated, dispirited, and dispersed army of the northern States, placed it in an attitude of victory, and assumed offensive operations; but envy snatched the palm out of his hand, and bestowed it upon another. Time, however, will do him that justice which his co-temporaries have refused. He is also the person who introduced the canal policy, and other polices which have elevated this State, and in some measure, given to it that exalted rank which it now holds in the confederation.

On the twenty-fourth day of March, in the same year, the act concerning roads, and inland navigation, and for other purposes,

was passed. The act, among other things, directed the commissioners of the land office, to cause to be explored, and the necessary surveys to be made of the ground between the Mohawk river and Wood creek, in the county of Oneida, and between the Hudson river and Wood creek, in the county of Washington, and to have estimates made of the probable expenses which would attend the constructing of canals between those streams, for loaded boats.

On the third day of January, 1792, the commissioners reported under that law, and stated, among other things, that the objects above-mentioned, were not only practicable, but attainable.

On the thirtieth day of March, 1792, was passed the act for establishing and opening lock navigation within the State—this act incorporated two companies; the one called the Western, and the other the Northern Inland Lock Navigation Company. The purposes of the western were declared to be for opening a lock navigation, from the navigable part of the Hudson, to Lake Ontario, and the Seneca lake, through the valley of the Mohawk. The northern was to extend from the boatable part of the Hudson, to the head of Lake Champlain. General Schuyler, then a senator, and a very active and influential member, appears to have been the principal promoter. Very soon after the act of incorporation, both companies were organized under his auspices, and commenced operations. Among the first steps taken by the companies, were the obtaining a scientific and practical engineer. They sent to England, where they procured a Mr. Weston. On his arrival, Mr. Weston made a survey from tide water on Hudson's river, at Troy, to Oswego, on Lake Ontario. In this survey he ascended the valley of the Mohawk as far as where the village of Rome now stands; from thence he proceeded across the summit level to Wood creek, and followed it down to Oneida lake. From thence he went to the outlet of Oneida lake, and traced it to Three River point, and thence along Oswego river, to its mouth, at Lake Ontario. According to this survey, the summit level, at Rome, was found to be three hundred and ninety feet above the tide water of the Hudson, and one hundred and ninety above Lake Ontario.

Subsequent surveys make the elevation of the summit level, four hundred and twenty feet above tide water. The discrepency in the admeasurements arose from this circumstance:—from Lansing's mills, above the Cohoos falls, on the Mohawk, to the city of Schenectady, the height of the river at the time prevented Mr. Weston from correctly ascertaining the levels. In this distance, he therefore estimated the probable ascent. He also made an estimate of the expense, which does not vary much from the expense of a portion of the Erie canal, of equal extent. The survey and estimate were made at the request and at the expense of the Western Inland Lock Navigation Company. These show that the company had extended views, and ulterior objects before them. General Schuyler had the superintendance of the whole, and seems to have originated the plans. Circumstances however, were not favourable for the developement and consummation of plans so vast.

The western country was new and nearly covered with forests: the resources of the company were scanty, and altogether inadequate to the design. The population of the State did not exceed four hundred thousand, a number under one fourth of what it contains at present. Nothing of moment, therefore, could be done by the company, but project and put their plans upon paper.

The Western Inland Lock Navigation Company shortly after the survey and estimate, commenced three small canals. The first was at Little Falls, on the north side of the Mohawk. It was one mile in length, had five locks, and depth of water for the passage of boats carrying twelve or fifteen tons. The second was at German flats, in the county of Herkimer. It had two locks, and exceeded one mile in length. The third was at Rome, in the county of Oneida. It was about one mile in extent, and had two locks. It reached from the Mohawk river to Wood creek. A feeder, upwards of a mile in length, taken out of the Mohawk, supplied it with water. Several dams and locks were erected on Wood creek, in order to facilitate the descent and ascent of boats. By means of these canals and locks boats were enabled to ascend the Mohawk, as high as Rome, pass

over the summit level, and descend Wood creek into Oneida lake. These works were finished in the year 1802. Thus much for the canals, and improvements made by the Western Inland Lock Navigation Company, Nothing effectual seems to have been done towards canals, from this time till 1817. Acts were, it is true, passed, surveys taken, estimates made, and reports drawn up, but these were all.

Much controversy has been had in relation to the projection of the Erie canal. Several individuals have claimed the honour. It would perhaps be assuming too much to attribute it to any single one. By this we mean the projection of the whole canal, from Lake Erie to the Hudson. We believe no dispute arose till the work had progressed to a considerable extent. Its practicability then became apparent. Honours, it were very justly believed, would attach to the name of its projector, could any of the claiments induce the public to believe him the one. We do not intend to express an opinion at present in relation to the projection of the Erie canal. All we shall do, will be to state facts. From these the reader, if he chooses, may form an opinion.

On the eighth of Febuary, in the year 1808, the Hon. Joshua Foreman, then a member of the assembly, from the county of Onondaga, moved that a joint committee be appointed to take into consideration, the propriety of exploring and causing an accurate survey to be made of the most eligible and direct route for a canal between Lake Erie and the tide waters of the Hudson.

At the time he made this resolution, it was supposed that the government of the United States would enter into the measure, and appropriate monies towards the making of a canal. This supposition was bottomed on that part of the President's message to congress in the preceding October; in which he recommended appropriations to such works. About this period the trade of that widely extended country, situated west of the Alleghany mountains, had become an object of importance, and was eagerly sought by several of the Atlantic states.

The resolution of Mr. Foreman met with a favourable reception. Messrs. Gold,* Foreman, Gilbert, Germain and Hogeboom, were appointed a committee on the part of the assembly, and Messrs. Taylor,† Nicholas and Ward on the part of the senate.

Mr. Gold, from the joint committee, on the 21st of March, in the same year, brought in a resolution, which was concurred in by both houses, that the surveyor-general be directed to cause an accurate survey to be made of the rivers and waters, in the usual rout of communication, between Lake Erie and Hudson's river, and such other contemplated routs as he might deem proper, and that he should cause maps to be constructed of the same.

In pursuance of this resolution, the surveyor-general employed the Hon. James Geddes, of the county of Onondaga, to make the necessary surveys, profiles, &c. His appointment and instructions bear date June 11th, 1808. By these instructions he was directed to explore the most feasable rout for a canal, from Oneida lake to Lake Ontario, through the town of Mexico, in the county of Oswego, and also the rout along Oneida and Oswego rivers, to the mouth of the latter stream. He was likewise directed to examine the ground between lakes Ontario and Erie, and the country between Tonnawanta creek and Seneca river. Such were the instructions. From these we infer that a diversity of opinion then existed in relation to the proper rout to be pursued.

In conformity to his instructions, Mr. Geddes reconnoitred the different routs, aud made a report to the surveyor-general, accompanied with maps and other drawings. His report bears date January 12th, 1809. These examinations, although not very accurate, owing to the scanty means furnished by the State, and the haste in which they were made, threw much light on the subject, and had a tendency of occasioning further examinations. They showed that a canal could be made from the

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* Thomas R. Gold, Esq. of Whitestown, Oneida county.

† Late Lieutenant Governor of this State.

Mohawk river to Lake Erie. In the session of 1809, the legislature do not seem to have taken up the subject. In the mean time other individuals used their influence. Among these we shall mention Dr. David Hoosack, and the late Dr. Hugh Williamson. Both of these gentlemen wrote several articles on canals and their utility. Those published by Dr. Hoosack may be seen in the American and Medical Philosophical Reg. vol. 2. They appeared in 1810.

On the 13th of March 1810, the Hon. Jonas Platt, then a senator from Whitestown, in the county of Oneida, and who afterwards presided as a judge of the Supreme Court of this State for many years, with distinguished honor, introduced a resolution which was concurred in by the legislature, that the Hon. Governor Morris, the Hon. Stephen Van Rensellaer, the Hon. De Witt Clinton, Simeon Dewitt, Esq., Gen. William North, Thomas Eddy, Esq., and Gen. Peter B. Porter, be appointed commissioners to explore the whole rout, examine the condition of the navigation, and consider what further improvements could be made in the navigation between Hudson's river and Lake Erie; and that they be authorised to direct, and procure surveys, and such other things as might further the same, and that they should report thereon to the next legislature.

The commissioners employed Mr. Geddes to re-explore the rout. They also repaired upon the ground, and examined the rout.

On the 2d day of March 1811, the commissioners, pursuant to the resolution of the legislature, made a long and able report, based upon examinations, surveys, &c. In this report they speak of inclined plains and of locks, but at the same time, observe that this would have to be determined by a competent engineer. From this it is manifest, that they had no fixed plan as to rises and falls. The estimated expense is put down at $500,0000. It is general and somewhat vague, but perhaps as accurate as could be expected from men unacquainted with making canals.

The commissioners forwarded a copy of their report, with urveys and profiles accompanying it, to Mr. Weston, of whom

we have formerly spoken, and who then resided in London, and solicited his opinion and views on canaling. These he gave, as will appear hereafter.

The report of the commissioners made a favourable impression on the legislature. An act to provide for the improvement of the internal navigation of the State was passed April 8th, 1811. In this act Messrs. Morris, Van Rensellaer, Clinton, Dewitt, North, Eddy, Porter, Livingston and Fulton, were named commissioners. The act empowered them to make application to Congress, and to the Legislatures of all or any of the States, to co-operate in the undertaking.—Also, to employ engineers, and make reports thereon. Fifteen thousand dollars were appropriated for these purposes.

The commissioners, on the 14th day of March 1812, made a second report. From this we learn that they had applied to Congress and the legislatures of most, or all of the United States, but without success. Congress intimated that it would make a grant of wild lands which should take effect after the completion of the contemplated canal, provided New-York would construct it at her own expense. The offer of Congress to give a tract of unsaleable and unproductive land, was very judiciously declined. In this place, it will be but just to remark, that the states of Massachusetts, Ohio and Tennesee were exceptions: in these states the legislature passed resolutions, instructing their representatives in Congress to use their influence in promoting the object.

The commissioners, in their application to Congress, deputed the Hon. Governor Morris, and the Hon. De Witt Clinton, two of their body. Upon their return they made a report of their mission. From it we learn that they failed in procuring the anticipated aids, in consequence of the jealousies of the members from most of the states. We deem it unnecessary to enter into particulars, in regard to a bill which Congress proposed to pass, granting certain unappropriated lands in Michigan and Indiana, because the conditions and restrictions imposed were such as to preclude an acceptance, had the bill passed into a law.

The war intervening soon after, occasioned an interruption, and the whole project of making a canal was laid aside. The commissioners, nothwithstanding, endeavoured to excite public attention towards the work. With this view, on the 8th of March 1814, they made a third report to the legislature. In this they recommended, in addition to the Erie canal, the making of the Champlain canal. The report, although able and well calculated to enlist public sentiment, had but little effect. The minds of men were not prepared to embark in projects so vast and so little understood. Two years elapsed before any effectual measures were adopted by the legislature in furtherence of these stupendous works. In the mean time, Messrs. Morris, Platt, Van Rensellaer and Clinton exerted their influence and talents in gaining prosolytes to the undertaking.

The commissioners, in the month of March 1816, made a fourth report, but it contains few or no additional facts, beyond those contained in the preceding reports. The report, however, in connection with the numerous petitions, from various counties presented to the legislature, praying that a law might be passed, directing the making of the canals, had a favourable impression on that body. Still, however, there was a strong opposition from certain members and leading men, and the whole project had well nigh fallen to the ground. The members of the opposition considered the project as visionary, and as the emanation of certain individuals who wished to get into power by means thereof. We shall not commend or censure them in their mistaken zeal. They had access to all the information contained in the reports and memorials, but they could not, or would not, comprehend it. The memorial from the city of New-York, drawn by Mr. Clinton, was lengthy, lucid and able. It descended into particulars—it developed the numerous advantages which our people would derive from canals. It is not our design to state the contents of this memorial, because it would be incompatible with a work of this kind ; but still, we cannot refrain from expressing our opinion, that such a document ought to do honour to an individual, in any country.

On the twenty-first of March, in the same year, Mr. Rutsen

Van Rensellaer, of Columbia county, from the joint committee of the senate and assembly, reported in favour of a canal, from Lake Erie to the Hudson, and also from the Hudson to Lake Champlain.

On the twenty-ninth of the same month, Mr. Van Rensellaer made a motion to consider the bill, entitled, " an act for improving the internal navigation of the State." This bill embraced the proposed canals. After very long and very animated debates, it was happily carried—the bill passed into a law on the seventeenth day of April 1816—in the law Messrs. Stephen Van Rensellaer, De Witt Clinton, Samuel Young, Joseph Ellicott and Myron Holly were created commissioners. The act instructed them to employ engineers, and to cause surveys, levels, profiles, &c. to be made. Seventy thousand dollars were voted for these services.

After the passage of the law the commissioners employed engineers and surveyors to explore the whole rout, take the necessary levels, and make profiles, or drawing of the same—they also reconnoitred the whole line, and made such personal observations and remarks as circumstances and time would permit.

In the month of February 1817, the commissioners made their fifth report—it is a document of great length. They enter very amply into details, such as distances, estimates, &c. The whole is founded upon data, given by the engineers, and upon personal observations. To shorten remarks, it is an able and interesting document, worthy the attention of every lover and promoter of internal improvements. It is such a paper as we should have expected from the board of commissioners.

On the nineteenth of March, the commissioners also made a report on the proposed Champlain canal. These reports made a deep impression on the legislature, and paved the way for the passage of acts authorising the commencement of the canals. In their report of the Erie canal, the commissioners divided it into three sections, the eastern, the middle, and the western.

Every thing being, as it were, prepared, and the way being opened for the sanction of the legislature, Mr. William D. Ford,

then a member from the county of Herkimer, moved the house that the report be referred to a joint committee of both houses—this motion was carried. A joint committee, consisting of Messrs. Ford, Pendleton, Child, Eckford and Wilcoxen was appointed. The object in view, by the appointment of this committee, was to examine the reports of the canal commissioners, and to report thereon, this being the usual mode in matters of moment. Mr. Ford, the mover, was named chairman *of the joint committee.* This gentleman examined the reports of the canal commissioners, and drew up a report which he laid before the legislature. In this report, Mr. Ford, as chairman, says, we have examined the subjects submitted to our consideration in the report of the commissioners, and have come to the conclusion, that the interest of the State requires that the legislature should, without delay, pass a law or adopt measures for the immediate commencement of the canals—meaning the Erie and Champlain canals.

In addition to sundry facts, the report contained the outlines of the canal fund. A fund devised for borrowing monies for the construction of the canals, paying the annual interest, and liquidating the debt, or principal sum or sums borrowed.

In this place, it may not be altogether out of order to mention, that the board of canal commissioners, by their president, Mr. Clinton, renewed the application for assistance to Congress—His letter bears date November 10th, 1816. He also addressed a letter to the Governor of Ohio, on the same subject, bearing date November the eleventh, of the same month. Congress paid no attention to it, but treated it with marked neglect. In Ohio, the Governor, Mr. Huntington, a man of liberal and enlightened views, laid his letter before the legislature, where a committee was appointed to take the matter up, and investigate it. Nothing, however, was done by the legislature of that State, beyond making a favourable report, and passing a resolution to take up the subject at their next meeting.

On the nineteenth of March 1817, Mr. William D. Ford, from the joint committee, brought into the assembly, the bill,

entitled, "an act concerning navigable communications, btween the great western and northern lakes, and the Atlantic Ocean."

This bill passed into a law on the fifteenth of April 1817—The law authorised the commissioners to cause to be made that part of the Erie canal, between Seneca river, at the Montezuma marshes, and Rome, and that part of the Champlain canal between Hudson's river and the mouth of Wood creek.

The first contract was dated June twenty-seventh, 1817—on the fourth day of July, in the same year, the first ground on the Erie canal was broken near Rome, in the presence of the commissioners, and a large concourse of citizens assembled to witness the commencement of this stupendous work. In 1817, nearly sixty miles of the Erie canal were contracted to be finished by the end of the year 1818. About fifteen miles of the sixty were completed before the end of the year 1817. A considerable portion of the Champlain canal was let out for construction the same year.

An act to improve the funds, and provide for the redemption of the funded debt, was passed on the twenty-first day of April 1818. During this year the works were carried on with great vigour.

Between the first of August and the tenth of December 1819, from two to three thousand men were constantly employed on the Erie canal.

The middle section of the Erie canal, extending from the Montezuma marshes to Utica, a distance of about ninety-four miles, was completed about the fifteenth of October 1819.—The branch leading from Syracuse to Onondaga lake was finished as far as Salina, about the same time.

On the twenty-third and twenty-fourth of October, in the same month, the commissioners navigated the canal in a boat, from Utica to Rome. Large boats navigated it seventy-five miles west of Utica.

Some part of the Champlain canal was finished about the same period.

On the twenty-second of February 1819, the Hon. Ezekiel Bacon of the county of Oneida, from the joint committee of the senate

and assembly, on so much of the speech of Mr. Clinton the Governor, as related to the internal improvements of the State, reported that provisions ought to be immediately made by law, for the completion of the western section of the Erie canal and for the construction of the Champlain canal, from Fort Edward, to the tide waters of the Hudson, &c. A bill was drawn up in pursuance of the foregoing report, which finally passed both houses on the second of April in the same year.

During this Session, Mr. Ezekiel Bacon, from the joint committee of both houses reported, that the improvement of the Oswego river and the other navigable communications, between Lake Ontario and the navigable waters leading into the Atlantic Ocean, ought to be taken into consideration; and that they therefore recommended to the house, to empower the canal commissioners to procure such surveys and examinations to be made, as to them might appear proper in relation to the attainment of these objects, and that they should report the same to the legislature at the next session, &c.

The chairman brought in a bill to this effect, which also went into a law.

In the years 1819 and 1820, forty-three miles of the western section, lying mostly on the east side of the Genesee river, were put under contract. In the latter year twenty-six miles of the eastern section, situated east of Utica, were also put under contract. It may not be amiss at this place to mention, that the Erie canal was divided into three sections. The western begins at Lake Erie, and ends at Seneca river. The middle begins at the latter river, and ends at Utica. The eastern begins at the latter place, and ends at the Albany basin. The middle was finished first.

From the extremes of this section, the operations were continued westwardly and eastwardly, until the remaining sections were also finished.

In the early part of the year 1821, the residue of the eastern section was put under contract. About the same time, that portion of the western section between Genesee river and Tonnawanta creek, was also put undercontract.

In the month of November 1821, boats descended as far as the Little Falls on the Mohawk.

The number of men employed on the eastern section in 1822, was from four thousand to seven thousand. Boats, towards the close of this year, navigated about two hundred and twenty miles. Towards the end of the year boats passed from the head of Lake Champlain to Waterford, on the Hudson.

The Erie canal was finished about the middle of October 1825. The first boat that ever passed from Lake Erie to the Hudson descended in the latter part of this month, with Mr. Clinton, then Governor of the State of New-York, and several other gentlemen on board, followed by another boat, having on board Mr. Talmage, the Lieutenant Governor, and the Hon. Henry Seymour, one of the canal commissioners.

The whole period which elapsed from the commencement to the completion of the Erie canal, was eight years, three months, and fifteen days.

The acting commissioners were Messrs. Holley, Hart, Seymour and Bouck. The engineers were Messrs. James Geddes, Benjamin Wright, Valentine Gill, David Thomas, Charles C. Broadhead, Isaac Briggs, Canvass White, Nathan S. Roberts, and David S. Bates. Messrs. Holley and Hart were appointed in 1816. Mr. Seymour succeeded the latter in 1820. Mr. Bouck was appointed upon the removal of Mr. Clinton in 1824.

The eastern section was constructed under the superintendance of Mr. Seymour, a very efficient commissioner.

Messrs. Clinton and Van Rensellaer, although not in the the strictest sense of the word, acting commissioners, performed very important services. They examined the whole rout before the commencement of the canal, and afterwards exerted their talents and influence in furthering its completion.

Among the engineers, the Hon. James Geddes and the Hon. Benjamin Wright, hold the first rank. The former was mostly employed on the western section, and the latter on the eastern. Both surveyed and superintended the middle. The one had the easterly half and the other the westerly.

Judge Geddes is the first person who reconnoitred the ground between Rome, in the county of Oneida, and Lake Erie, and made maps, and other drawings, with some topographical sketches. In 1811 he re-examined the same ground. From then to 1822, he was more or less engaged. In almost every important service we find him directly or indirectly concerned.

The Champlain canal was begun in June 1818, and finished in September 1823. Mr. Samuel Young was the acting commissioner. Col. Lewis Garin was employed as an engineer at an early period. In 1820, Mr. William Jerome succeeded him. The first we hear of this canal is in the report made the eighth of March 1814, by Messrs. Morris, Van Rensellear, Clinton, Dewitt, Eddy, North, Porter, Livingston and Fulton, then commissioners.

ERIE CANAL.

THIS canal commences at the harbour of Black Rock, at the outlet of Lake Erie, and extends eastwardly to the Hudson, at Albany. It is about three hundred and sixty-three miles in length, and commonly forty feet in breadth at the top, and twenty-eight at the bottom, with a depth of four feet of water. It runs along the western border of the county of Erie, on the margin of the river Niagara, from Black Rock to Tonnawanta creek, eight miles; and thence, up that creek about ten miles, where it turns and passes across the southeasterly part of the county of Niagara, and enters the county of Orleans, which it crosses nearly from west to east; it then traverses the counties of Monroe and Wayne, touches the north angle of Seneca, and passes into the county of Cayuga. It then pursues the same easterly course through the counties of Cayuga, Onondaga, Madison, Oneida, Herkimer, Montgomery, Schenectady, Saratoga and Albany, to the valley of the Hudson, where it turns and takes a southerly direction to the Albany basin, the place of its termination.

Fron Black Rock to near the village of Pittsford, in the county of Monroe, it passes along and through the great western plain. It then passes through a strip of country diversified with a multitude of swells and ridges, and reaches Mud creek, near the village of Palmyra. It then continues along that creek, and through a swale, to near the village of Lyons, in the county of Wayne. From thence, its course is through the Canandaigua, and Seneca, and Oneida vales, to the confines of the county of Herkimer; and then through the valley of the Mohawk, to the Hudson.

The general directions of the canal may be set down as follows—first, from Black Rock to some miles below Lock Port, in the county of Niagara, northeasterly—second, easterly to within five miles of Rochester, on Genesee river, in the county of Monroe—third, southeasterly to about two or three miles eastwardly of the village of Pittsford—fourth, then north northeasterly about four miles—fifth, then east southeasterly to Seneca river—sixth, then about easterly to near Cowassalon creek, in the county of Madison—seventh, then nearly northeasterly to the Cedar Swamp at Rome, in the county of Oneida—eighth, then east southeasterly to the Grand Junction in the town of Watervliet, in the county of Albany—ninth, then southerly to the Albany basin. In these directions, which are general, we have not noticed the numerous sweeps and curves which it makes. Averaging all the courses of the canal it will be found that its general direction is about east, inclining a little to the southeast. A straight line drawn from Black Rock to Albany is 245 miles. The tortuous line of the canal is 363 miles. The difference between the two lines is 118 miles. From the preceding the reader will perceive that the canal is very crooked. After the country is cleared it is not improbable but some corrections will be made whereby the line will be shortened a few miles.

The Erie canal is divided into eighty-two basins. It has eighty-three locks, independant of the five ascending locks at Lock Port. The towing path is about eight feet broad. The locks are descending and ascending, and consist of five series.

The first series are descending, and are twenty-one in number.

They end a little east of Clyde. Five of these are at the village of Lock Port, in the county of Niagara, on the declivity of a steep, and have falls of eleven feet nine inches each. The locks at this place are double, consisting of ten. The one set is for the descent, and the other for the ascent of boats. All the other locks on the canal are single. These locks are at the end of the Buffalo level. The Buffalo level, including the harbour of Black Rock and the Buffalo branch, is about thirty miles long.

Five are at the east end of the Rochester level, in the space of one mile and three-quarters, and have descents of seven feet five inches each. The Rochester level is sixty-three miles long.

There is one lock at Pittsford of eight feet descent. The Pittsford level is about eight miles and a-half long. This level begins about two miles east of Genesee river.

There is one lock at the end of the Teoronto, or Irondequot level, of ten feet descent. This level is fifteen miles long.

Three-quarters of a mile east of the preceding, there is a lock with a drop of ten feet. The latter is a little west of the village of Palmyra, in Wayne county.

Twelve miles east of the last lock, there are three locks in a short distance, with drops of eight feet each. This level is called the Palmyra level.

At the distance of three and a-half miles from the last of the three preceding, there is one of ten feet drop.

About four miles east of the last, there is a lock with a descent of six feet. This is at the village of Lyons, in the county of Wayne.

Four miles and a-half east there is one of seven feet descent. This level is called the Lyons level.

The Clyde level is about five miles long, and ends in a lock which has a fall of five feet.

The next is the Canandaigua level, and is six miles and a-half in length, and ends in a lock with a descent of nine feet.

The last lock of the first series of descending locks, is on the western border of the Montezuma marshes.

The entire depression, from Lake Erie to Seneca river, on

the Montezuma level, is one hundred and ninety-six feet, and is surmounted by twenty-one locks. We exclude fractions. The lockage, in the aggregate, amounts to one hundred and eighty-four feet and ten inches. The distance is one hundred and sixty miles.

The second series of locks are ascending, and are four in number. They commence on the east side of Seneca river, at the termination of the Montezuma level.

The first has a lift or ascent of seven feet. It is six miles distant from the last lock of the first series of descending locks.

The second is a mile and a-half east, and has an ascent of nine feet.

The third is near Bucksville, distant from the foregoing four miles, and has a lift of nine feet.

The fourth is at Jourdan's basin, in the county of Onondaga, and has an ascent of eleven feet. The distance between this and the preceding is about nine miles.

The elevation of the second series of locks is about thirty-six feet. The distance occupied by the first series of ascending locks is about fifteen miles and a-half.

Here there is a level of twelve miles, at the end of which the third series of locks, and the second of the descending locks, begin. They are two in number. The first is at the end of the level on the east side of Otisco, or Nine Mile creek, in the town of Camillus, county of Onondaga, and has a descent, or drop, of eleven feet.

The second is seven miles east, and has a descent of six feet. This lock is a little east of the village of Geddesburg, in the town of Salina, Onondaga county.

The depression of the second series of descending locks, is but seventeen feet.

The fourth series are three in number, and are ascending. They commence about one mile and a-quarter east of the last lock of the second series of descending locks, and are in the town of Salina, a little east of the village of Syracuse.

The first has a lift of six feet, and is eighty rods east of Syracuse.

The second is nearly one mile east, and has a rise of ten feet.

The third is close by, and has an ascent of ten feet.

The second series of ascending locks have an elevation of twenty-six feet. The long level begins at the last of these locks, and stretches eastwardly to Frankfort, in the county of Herkimer, a distance of sixty-nine miles and a-half. This level is in the counties of Onondaga, Madison, Oneida and Herkimer. It occupies the entire width of two of these. Its main being in Madison and Oneida, and its wings or extremeties in Onondaga and Herkimer. Among canal levels this may be ranked one of the longest in the world.

The fifth and last series of locks, are fifty-three in number. They begin at the east end of the Long level, and are all descending.

The first has a descent of eight feet. This is at the end of the Long level.

The second is one mile distant, and has also a descent of eight feet.

The third is half a mile distant from the second, and has likewise a descent of eight feet.

The fourth, like the preceding, has a descent of eight feet. It is two miles and an half from the third.

The fifth is a-quarter of a mile east of the fourth, and has the same descent.

The sixth is rather over two miles from the fifth, and has a fall of nine feet.

The seventh is nearly three miles below the sixth, and has a fall of eight feet.

Three miles east of the seventh there is one with a descent of eight feet. This lock is at the head of Little Falls.

In the distance of one mile and a-quarter from the latter, there are four locks, each of which has a fall or drop of eight feet. At the foot of the last a level of five miles extent begins. The number of locks at Little Falls is five.

The thirteenth lock is at the termination of the last level, and has a descent of eight feet.

The fourteenth is four miles east of the thirteenth. Its descent is eight feet. This lock is in Minden, in the county of Montgomery. The preceding are in the county of Herkimer.

The fifteenth is three miles and three-quarters below the fourteenth. Its descent is also eight feet.

The sixteenth is four miles and three-quarters east of the fifteenth. It has a descent of seven feet. This is likewise in Minden.

The seventeenth has a descent of eight feet. It is three miles and a-quarter east of the sixteenth. This lock is at Canajoharie.

The eighteenth is twelve miles east of the seventeenth, and has a descent of seven feet. This lock is in Glen.

The nineteenth has a descent of six feet. It is on the west side of Schoharie creek.

The twentieth is on the east side of Schoharie creek, and distant about half a mile. Its descent is four feet.

The twenty-first is distant three miles from the foregoing, and has a descent of eight feet.

The twenty-second is about half a mile distant, and has a fall of eight feet.

About one mile below is the twenty-third, with a drop of eight feet. The four last named locks are in the town of Florida, in the county of Montgomery.

The twenty-fourth is four miles distant from the last, and has a fall of eight feet.

The twenty-fifth is about five miles east, and has the same descent.

The twenty-sixth has the like fall.

This is at the west end of the Schenectady level.

The twenty-seventh is at the end of the Schenectady level, and has a descent of seven feet. This lock is in the town of Half Moon, county of Saratoga, and directly below the upper aqueduct.

The twenty-eighth and twenty-ninth are a little below, and have also descents of seven feet each.

The thirtieth is distant from the last about two miles. Its descent is likewise seven feet.

The thirty-first has a fall of seven feet, and is a mile and an half from the preceding.

The thirty-second is also in the county of Saratoga, and has the like fall. It is three miles and an half below the thirty-first.

The thirty-third is five miles from the last, and has a descent of eight feet. This lock is in the town of Watervliet, in the county of Albany.

The thirty-fourth, thirty-fifth and thirty-sixth are about three miles from the thirty-third, and have severally descents of eight feet.

The thirty-seventh and thirty-eighth are about a mile and a-quarter below the thirty-sixth, and have respectively descents of nine feet.

These locks are a little below the noted Cohoos Falls.

About a-quarter of a mile below the thirty-eighth is the thirty-ninth, with a descent of nine feet.

The fortieth has the same descent.

The nine locks, as they are called, commence half a mile below the fortieth. They are all in full view, and descend with their basins like so many terraces. Each has a descent of eight feet. The Northern, or Champlain canal, unites with the Erie between the seventh and eighth locks. The place of meeting is denominated the Grand Junction.

The fiftieth lock has a descent of eleven feet.

The fifty-first has the same descent.

The fifty-second has a corresponding descent.

The fifty-third is the last lock of the fifth series. It is at the Albany basin, and has a descent of eleven feet.

The whole depression from the east end of the Long level to the Albany basin, is 425 feet.

The level of the junction above the tide water of the Hudson is	44 feet.
The Schenectady level is	226 feet.
The Long level is	425 feet.
The Montezuma level is	370 feet.
The Rochester level is	506 feet.
The Buffalo level is	566 feet.

The Erie canal is carried over many streams, in aqueducts and on culverts. These afford channels for so many rivers, creeks, brooks and torrents which flow under it. It also passes over numerous vallies and ravines on mounds, and crosses some streams through dams. The dams are entered and left through guard locks. These are constructed to prevent large masses of water from rushing into the canal in freshets and rises.

There are ——— bridges at present. The number will be more than doubled when the lands on the middle and western sections are cleared and cultivated.

The waste weirs amount to ———, and are designed to discharge the surplus waters from the canal.

The locks are each ninety feet in length within the gates, and fifteen feet in breadth. They are passed by boats, in ordinary times, in four minutes. They are all constructed with limestone, or sandstone laid in cement, made of water limestone. The guard locks are also constructed with the same materials. They are solid structures, and are not surpassed in design, beauty and utility by any locks in the world.

There are several aqueducts, culverts, mounds and dams which deserve particular notice. We shall endeavour to take them up in order, commencing at the west with the aqueducts.

The first is an aqueduct of stone, over Oak Orchard creek, in the county of Orleans, with a span of sixty feet. The mounds which join it to the canal are about one hundred and fifty feet in length.

The aqueduct over Genesee river, at Rochester, in the county of Monroe, is seven hundred and fifty feet in length. It has twelve piers and eleven arches. The two exterior arches are over mill races or courses, and are each forty feet span, while those over the river, consisting of nine, are each fifty feet. The piers are based upon the limestone rock, which forms the bed of the river. The parapets are each about four feet eight inches broad. That on the north side, which is used for a tow path, has an iron railing. Both form delightsome promenades. The aqueduct, except the parapets, is constructed of red sandstone, laid in cement. The parapets are made of blue lime-

stone, cut in large oblong tables, which are joined together with strong iron clamps. It is the most splendid work on the whole canal. William Brittin, the architect, died before its completion.

The aqueduct over Mud creek, near the village of Lyons, in Wayne county, stands on four piers, and has three arches, whose spans are severally thirty feet. It is a stone structure.

The aqueduct over the Owasco outlet, at Bucksville, in the county of Cayuga, is built of stone. It has four arches of twenty feet span each. Its entire length is about one hundred and twenty feet. It is five miles east of the Montezuma marshes. The surface of the stream, at low water mark, is twelve feet and an half below the top water line of the canal.

There is a stone aqueduct over Skaneatelis outlet, in Onondaga county, which has three arches, and is one hundred feet in length. The embankments connecting it with the canal, are considerable for extent.

The canal is carried over Otisco, or Nine Mile creek, in an aqueduct of stone one hundred and twenty feet long. It has two arches of thirty feet span each. A mound on the west side of the stream forms a union or connection with it. The lock at the east end of the aqueduct nearly supersedes the necessity of a continuation across the valley of the stream.

At Onondaga creek there is an aqueduct that has four arches, whose spans in the aggregate are one hundred and twenty feet. Each is thirty feet. Mounds, or raised ridges join it to the canal. The length of the aqueduct, including piers, is one hundred and eighty feet.

The aqueduct and embankment over Oneida creek, taken together, are about four hundred feet in length, and from twenty to twenty-six feet in heighth. The aqueduct alone is one hundred and twenty feet.

The aqueduct over the Mohawk river, in the county of Herkimer, ranks next to that over Genesee river, at Rochester. It is two hundred and fourteen feet long, and twenty-four feet broad. The walls of the parapets are four feet six inches high, and four feet broad. The water course between the parapet walls is sixteen feet in breadth. This aqueduct has four piers

and three arches. The central arch has a span of seventy feet, which is the greatest on the canal, and serves to conduct the waters of the river in ordinary times. The two outer arches have severally spans of fifty feet. There is an iron balustrade on the right side of the western parapet. The parapets make picturesque walks. The whole is built of secondary limestone, and is a noble structure. This aqueduct serves to connect the old canal with the Erie, and for a feeder. Two mounds, surpassing two hundred and fifty feet in length, constructed of stone and earth, form links between the canals and aqueduct.

The aqueducts, constructed of stone and wood, next claim our attention—we shall begin with the aqueduct over Mud creek, near the village of Palmyra, in Wayne county. It is upwards of one hundred feet long, and rests on piers of stone.

The aqueduct over Crane brook, in the county of Cayuga, is one hundred feet in length; that over Cold Spring brook is also one hundred feet.

Those over Butternut, Limestone and Chittiningo creeks, in the counties of Onondaga and Madison, are severally one hundred and ten feet in length.

The Canasaraga is only forty feet. That over Wood creek, Oneida county, has the same length.

The aqueduct over Oriskinny, is one hundred and twenty feet long—it has been constructed since the completion of the middle section, and is a deviation from the original plan of the canal.

That over the Sauquait, at Whitesborough, in the county of Oneida, is two hundred and forty feet long.

The mounds connecting it with the banks of the valley, are two thousand six hundred and forty feet long.

That over Myers' creek, in the county of Herkimer, is sixty feet long. Mounds unite it with the outlines of the creek's valley. They are four hundred and seventy paces long.

The aqueduct over Fulmer's creek, in Germanflats, in the latter county, is two hundred and twenty-eight feet in length.

The canal passes the Mohawk river, in two large aqueducts—the first is seven hundred and forty-eight feet in length, and twenty-four feet in heighth—it is four miles northeasterly of the

city of Schenectady. The trunk is supported by sixteen oblong abutments of limestone, standing on the Shistic rock, which forms the bed of the river.

The second is twelve miles east southeast of the preceding—it is eleven hundred and eighty-eight feet in length, and twenty-four feet in height. Twenty-six oblong stone abutments, based on slate, underlaying the river, support it. Each of these structures has a tow path, about eight feet wide, with a railing along which the horse drawing the boat, passes.

There are many other stone and wooden aqueducts which merit notice, but the bare insertion would swell this article too much. The stone aqueducts vary from fifty to seven hundred and fifty feet, and the wooden from twenty to eleven hundred and eighty-eight. We have not been so particular about elevations and breadths as we could have wished, but this fault is not ours, the commissioners and engineers have not in their voluminous reports furnished data.

The culverts on the canal are numerous—they are designed for the passage of small streams under the canal.

The culverts between Genesee river and the Montezuma marshes, are twenty-one in number—they are all made of stone and arched.

Between Montezuma and Utica the culverts amount to twenty-three. Eight are of stone, and fifteen of cast iron. The stone culverts are from sixty-four to one hundred and twenty feet long, and have spans varying from eight to fourteen feet—the iron culverts are much less.

The number between Little Falls and Schenectady is sixty. They are made of stone.

Mounds and embankments constitute an important feature in the canal.

The mounds or embankments over Eighteen Mile and Johnson's creeks, in the counties of Niagara and Orleans, have considerable length, breadth and elevation. They are carried across ravines.

The streams themselves flow through stone culverts under the canal.

There is also an embankment carried across the ravine of Otter creek, a branch of Oak Orchard—these ravines are not deep.

The embankments over Sandy creek and Rush brook are short—the former is seventy-six feet, perpendicular elevation, and the latter twenty-six. The preceding mounds and embankments are west of Genesee river.

The Irondequot embankment is the greatest work of the kind, on the whole canal. Its length is one thousand six hundred and fifty yards, and its height from forty to seventy-six feet. It is partly natural, and partly artificial—it extends in a winding direction, across the valley of Irondequot. Three slender ridges, stretching in the direction of the canal, are united by mounds or embankments. The two first are joined by a mound four hundred and forty yards in length, raised to the height of seventy-six feet. The second and third are connected by a mound seventy-seven yards in length—their declivities are rapid. These ridges are so very narrow at their bases, that, in some places, stone walls have been built on both sides, in order to hold them up. The canal is on the summit of the embankment. The Irondequot creek runs under it through a stone culvert, two hundred and forty-five feet long, seventeen feet high, and twenty-six feet broad. The arch of the culvert stands upon one thousand spiles, of one foot diameter each, driven from ten to twenty feet in the earth. The surface of the spiles is seventy-two feet below the top water line of the canal—this is the highest part of the embankment, and is wholly artificial. The country hereabouts, for an extent of several miles, on all sides, is thrown up into little ridges and hillocks which have no determinate direction. Hence, almost insuperable difficulties presented themselves to carrying the canal from Genesee river to Mud creek. These however, were surmounted by Mr. Geddes, after spending nearly two months in examinations. This is the only pass from the former to the latter stream. The skill of the engineer was put to greater test at this place, than at any other on the canal.

In the town of Manlius, in the county of Onondaga, the canal crosses Cadwell's Swamp. Two embankments of seven hundred and four yards each, have been stretched across this swamp—these confine the waters of the canal. This swamp is timbered with cedar, and is mostly flooded during the whole year—its soil is soft and very spungy.

There are embankments at Limestone, Beaverdam, Chittiningo, Canasaraga, Canestota, Oneida, Brandy, Brown and Sauquait creeks, and Nail brook. These streams are east of Cadwell's Swamp, and west of Utica—we shall only notice two of these.

The first is stretched across the delightsome valley of the Sauquait, at the village of Whitesborough, Oneida county—it is eight hundred and eighty yards long, and is divided by the aqueduct over the creek—it is from eight to twelve feet high.

The second is at Nail brook, about midway between the villages of Whitesborough and Utica. Its length is one hundred and seventy-six yards, and its perpendicular height about eighteen feet.

Immediately east of Utica there is an embankment fifty yards ong, and eighteen or twenty feet high.

At Clark's creek, one mile east of Utica, there is an embankment one hundred yards in length, and of the elevation of thirteen feet.

In the town of Frankfort, in the county of Herkimer, about nine miles east of Utica, there is an embankment five hundred yards in extent, separated by the wooden aqueduct over the stream.

At the Dugway, in the town of Germanflats, nearly a mile above the confluence of West Canada creek, there is an embankment five hundred and fifty yards in length, and fifteen feet perpendicular elevation. It is wholly in the river, and embraces part of the bed. The canal is in part natural, and in part artificial—the outer side of the embankment is defended against the stream by a reclining wall made of stone.

This noble work was made, and we believe projected by the late Mr. James A. Sherwood, one of the canal contractors.—

This gentleman, whose name merits a place with those of the promoters of canals, constructed about twelve miles of the Erie canal.

The principal dams are over Tonnawanta, Canasaraga, Nowadaga, Osquake, Canajoharie, and Schoharie creeks—the dam over Tonnawanta is five feet high, and near the mouth of the stream—it elevates the waters and occasions them to be slack for eleven miles upwardly. The waters of this dam are on a level with those in the harbour of Black Rock. Were the dam raised three feet higher the waters of Tonnawanta would flow into that harbour. The canal enters by a guard lock, just above the dam. Tonnawanta is used as part of the canal for ten miles—its width is about forty yards.

The towing path is on the margin of the stream—the country on all sides is remarkably flat.

The dam over Schoharie creek, in the county of Montgomery, measures six hundred and fifty feet in length, and consists of wood—its height is eight feet.

The dams on the streams falling into the Mohawk, are often obstructed with muddy deposites which occasion considerable delays, at particular times. The depositions are mostly during freshets—there is no preventing them. Several of these streams might have been passed on aqueducts, had certain levels and locks been differently located—the error is now remediless. Again, when the streams are very high, the gates of the guard locks cannot be opened at all. Hence, detentions injurious to the carriers of produce.

There are several lateral and branch canals connected with the Erie—most of these are used as feeders.

The first that we shall notice is the Buffalo branch—it is about a mile and a-half in length, and extends from Buffalo creek to the upper part of the harbour of Black Rock. Its entrance into this harbour, is a-quarter of a mile below Bird Island. This canal connects the village of Buffalo, in its commercial relations, with the Erie canal.

The second is Oak Orchard creek. This is taken in about twenty miles east northeast of the village of Lock Port. Its

length is about twenty miles—it is in part artificial, and in part natural. The waters of Tonnawanta creek, about twenty-five miles from its mouth, have been diverted, in part, by a canal four or five mile in length, and are discharged into Oak Orchard. This constitutes a part of the feeder. The canal is towards the west part of Tonnawanta swamp.

The third is the feeder at Rochester. It commences on the east side of Genesee river, about two miles south of the canal, and enters through a spacious basin, situated a little to the southeast of the aqueduct. Its breadth is twenty-six feet, and depth three feet. A portion of the water of the river is turned into it by a dam thrown across the stream. The dam is two hundred yards in length, and eighteen inches in height. It stands on a rock, at the head of a gentle rapid. There is a guard lock near the head of the feeder. Boats pass to and from Genesee river.

The fourth is at Syracuse, in the county of Onondaga, and is about two miles in length. It is a branch canal, and serves to connect Onondaga lake with the Erie canal. It passes through the village of Selina, situated at the head of the lake. The celebrated Saline Springs are at this place in a marsh. There are five locks on this canal, having in the aggregate thirty-eight feet descent. The Oswego canal, now constructing, is to be joined to this. It will then be called the Oswego canal. It is now almost finished.

The fifth is the feeder at Orville, in the town of Manlius, in the county of Onondaga. It is two miles in length, and conducts the waters of Butternut creek, a fine stream, into the canal. Boats ascend as far as the north Seneca turnpike.

The sixth is the Chittiningo, in the town of Sullivan, in the county of Madison. This is a branch canal. It has four locks with descents of six feet each. Its length is nearly two miles. The waters of the Chittiningo creek are introduced by it.

The seventh is the feeder, taken out of the Mohawk, in the vicinity of the village of Rome, in the county of Oneida. It is two miles long, and draws all the waters from the river in

drouths. Most of this was made in 1801 or 1802, under the superintendence of Gen. Schuyler, and was intended to supply the old canal leading from the Mohawk across the summit level to Wood creek. It is navigated by boats up to Rome, distant a-quarter of a mile from the Erie canal.

The eighth feeder is at the Little Falls, in the county of Herkimer. It is about half a mile in length. The water is carried over the river in a superb aqueduct. There is a spacious basin at the village of Little Falls appended to it. Boats come to and go from the basin.

The ninth feeder is taken out of the Mohawk river, at Minden, in the county of Montgomery. A dam eleven feet in height was constructed across the river, in order to elevate and divert a portion of the water. This feeder is about a mile and a-half in extent.

The other feeders are short and of less moment, and are not navigable. An insertion is not deemed necessary.

Connected with the canal are Hydrostatic locks. These are for weighing loaded boats. They are located at Troy, Utica, Syracuse, and we believe one or two other places.

Opposite to Troy there is a large basin communicating on the one side with the canal, and on the other with the Hudson, by two locks of eleven feet descent each. Boats pass through the basin into the Hudson, and *vice versa*. By this means the rising city of Troy participates in the benefits diffused by the Erie canal.

The harbour of Black Rock. This harbour is partly in Lake Erie, and partly in the Niagara river. It is four thousand five hundred and sixty-five yards in length from south to north, and from eighty-eight to two hundred and twenty yards in breadth. Its superfices is estimated at one hundred and thirty-six acres. Two islands and a mole separate it from the lake and river, except at the upper end, where it is open. The first island is called Bird Island. It is in the lake, at the head of the harbour, and is bare except when the lake is high. Its length is two hundred and twenty yards. It constitutes so much of one side of the harbour. The second is called Squaw Is-

land. It is at the lower end of the harbour in the river, and is about seventeen hundred and sixty yards in length. It is low, flat and marshy, and is covered with grass. A mole two thousand nine hundred and fifteen yards in length, connects these islands. Towards the lower end of Squaw Island, a mole or dam, one hundred and sixty-five yards in length, has been made which connects the latter island to the main. The mole extending from Bird to Squaw Islands, is composed of two series of wooden cribs, placed in contact, and filled with stones. From the bottom to the top of the mole is sixteen feet. The outer side of the mole is from one to four feet above the water in the lake and river. The lowest part is at Bird Island, and the highest at Squaw Island, the pier rising all the way gradually from the former to the latter island. The width of the mole is eighteen feet. At the lower end of the mole an embankment has been made on Squaw Island, which extends downwardly fourteen hundred and thirty yards, to the mole or dam which joins the latter to the main. Its height is eight feet. Its breadth, at its base, is thirty feet, and at its apex six.

The mole or dam from Squaw Island to the main, is raised sufficiently above the water to create a head of about four feet, which is on a level with the surface of the lake. On this mole there is a lock, with a lift of about four feet, for the passage of lake vessels or boats in and out of Niagara river. The Erie canal commences a little above the mole.

The average depth of water in the harbour, is about fifteen feet.

The medial distance from the shore to Squaw Island is forty rods, and to the pier or mole uniting Bird and Squaw Islands, sixteen.

The shores and bottom of the river are limestone.

From the preceding description, it will be seen that the harbour of Black Rock has the main on the east, a mole on the north, and two islands and a mole on the west. The whole is natural except the moles and embankment on Squaw Island. The embankment is on the east side of the island, and stretches from the upper to the lower mole. The two moles, and the

embankment between them, are in the aggregate four thousand five hundred and ten yards in length. The moles are simply cribs or boxes, constructed of wood, and filled with loose stones, and sunk to the bottom of the lake and river. The harbour is two miles and an half and thirty rods in length, and from sixteen to forty rods in breadth.

The entrance on the side of Lake Erie is narrow. No vessel can come in from the lake in a storm, unless by accident. Vessels must either make the Buffalo harbour, which is not very good, or descend the Niagara river, by running down near the Canada side. We shall not take upon ourselves to decide whether the location of a harbour at this place has been the result of cool and sober deliberation or not. Those in favour, as well as those against the location, have not in the abundance of their zeal, thrown as much light on the subject as we could have desired, but it is sufficient for our purpose.

The Albany basin, at the termination of the Erie and Champlain canals, is four thousand four hundred feet in length, and from two to three hundred feet in breadth. It has an average depth, in ordinary times, of ten feet of water, and contains about thirty-two acres. Two moles separate it from the river. That on the east is four thousand four hundred feet long from north to south, and eighty feet broad. That on the south is three hundred feet long from east to west, and of the same breadth. The moles are united, and rise twenty feet above low water mark. Both are joined to the river bank. The southern mole has a lock for the ingress and egress of boats, sloops, &c.

The basin, except the moles, is natural, and will admit nearly one thousand canal boats, and thirty sloops. The canal enters at the head of the basin through a lock, having a descent of eleven feet.

Recapitulation. The Erie canal is three hundred and sixty-three miles in length, forty feet in breadth, and four feet in depth. It is divided into eighty-two basins, which are separated by eighty-three locks, exclusive of the Black Rock harbour and Albany basin. All the locks aside from those at the village

of Lock Port, are single.* The lockage, in the aggregate, amounts to six hundred and seventy-eight feet ten inches. The two locks opposite to the city of Troy, whose lockage is twenty-two feet, are not included, nor are the five ascending locks at Lock Port, whose lockage is fifty-eight feet nine inches. The locks consist of five series; three are descending, and two ascending. The descending series have six hundred and sixteen feet and ten inches of lockage, and the ascending sixty-two.

There are five locks on the branch canal at Selina, whose lockage is thirty-eight feet, and four on the Chittiningo, whose lockage is twenty-four feet. All the locks, including the ascending at Lock Port, and those on the branches opposite to Troy, amount to ninty-nine, and the lockage to eight hundred and thirty-one feet eight inches.

The Erie canal is artificial, except about ten miles, where Tonnawanta creek is substituted. The basins, at its extremities, aside of the moles, are natural. These dip into Lake Erie and the Hudson, and may be denominated links, because they join those waters to an immense chain of canal.

Observations on the country along the line of Erie canal.

The country from Black Rock to Lock Port, although an elevated plain, is in general wet.

Much of the line between Tonnawanta creek and Lock Port is swampy, and so much so, that in constructing the canal, the operations had to be commenced at the extremities, in order to drain off the waters before the middle could be begun. The distance is six miles. About one mile was opened firstly at each end. In 1821, when operations were began hereabouts, almost the whole line from Tonnawanta to Oak Orchard creek, was an unsettled wilderness, and very heavily timbered, and much of it under water. Roads had to be opened before the line could be approached in many places.

* Some of the locks on the eastern section, have been doubled since the construction of the canal, which would increase the number some; but we cannot say with certainty, how many have been made. Our chapter on canals was wrote more than two years ago, and before the additional locks were constructed.

Between Oak Orchard creek and Pittsford, on the east side of Genesee river, the country is equally flat, but not so wet and swampy.

Between the Irondequot embankment and the village of Palmyra, seven miles of the canal pass through a deep swamp, whose stagnant waters take different directions, some flowing into Irondequot creek, and others into Mud creek.

Along Mud creek and the swale, through which the canal runs, before it re-enters the valley of that stream, above Lyons, there are considerable strips and lines of wet and swampy lands. From this point to the Montezuma marshes, it is mostly humid, or swamp land. The course of the canal along and across these marshes, is eleven miles. The surface is wet, spongy and miry. These marshes are annually inundated.

From Montezuma, to Oriskinny creek, in the county of Oneida, a distance of eighty-seven miles, at least three-fourths may be pronounced wet and swampy land. The swamps are often long, deep and boggy. The most considerable swamps, for extent, are covered with cedar trees, that stand so close as almost to inhibit the rays of the sun from the earth. These swamps are usually sub-merged, or partly so, all the year, and in their natural state, are nearly impassable. In some instances it became necessary to commence the canal at the sides or ends of these swamps, and work towards the middle. This occasioned slow drainings of the standing waters—there is one of these swamps in Camillus, upwards of three miles in length, and the course of the canal lays directly through it—the waters passed from it at its ends, in different courses. Nothing could be done before drains were formed, and these were nearly commensurate with making the canal. The surface consisted of black vegetable earth, having but little or no cohesion. Below this *is* marl, which *does* not allow water to pass through it. The former upon the draining of the waters settled and shrunk. The same description will apply with some modifications, to the other cedar swamps—the alder and black ash swamps were nearly as wet and spongy. We have mentioned these facts, that posterity may have some ideas of the obstacles which a country

mostly covered with wood, and intersected by swamps, opposed to the making of the canal, for these swamps will disappear upon cutting down the trees, making drains, and introducing cultivation.

The country, eastwardly of Oriskinny, was mostly cleared and cultivated, and therefore presented but few of the asperities above enumerated.

The operations, on the Montezuma marshes, were slow in consequence of inundations and sickness. The labours could not be commenced before the latter part of May, at which period the waters usually abate. The sickness, such as fevers, agues, &c. came on about the first of August, and raged till the first of October. Most of the men became diseased, and the labours had in a measure to be suspended—numbers died. The men employed usually were from two to seven hundred—two years were spent in making the canal across these marshes.

For twenty-four miles the canal runs at no great distance from Seneca river, a very sluggish stream. In spring and fall the waters overspread large tracts of land. The streams from the hills south of the canal extend the inundations. Excessive and long continued heat generates a deadly miasma which contaminates the atmosphere. In 1819, between the middle of July and the first October, one thousand of the men employed between the Montezuma marshes and Salina, at the head of Onondaga Lake, were attacked with agues, bilious and typhus fevers, and other diseases, which raged with violence, and swept off considerable numbers. Most of the lands, along Seneca river, are still covered with woods. The inhabitants, residing in the vicinity of the stream, are annually visited by fevers, which often prove fatal.

These were not the only tracts on the line of the canal where the workmen were afflicted with fevers, but as the others were limited, we shall pass over them.

Between Tonnawanta creek and Lock Port there was much deep excavation, and mostly through rocks. On leaving the creek the excavation was twelve feet. In proceeding towards the latter place, for four miles and a-half, it increased to thirty-

one feet. From thence to the first lock, one mile and a-half, it decreased to thirteen. Midway between the creek and first lock, the rock excavation commenced. For two miles of this distance the rock rises to within from two to six feet of the surface. The rock is limestone, and in horizontal layers. Upwards of four years were consumed in the operations at this place. The rock being compact could not be removed without blasting. Where excavation depends on drilling and blasting, the work progresses very slowly.

The locks at Lock Port are on the declivity of a steep which overlooks a capacious basin formed by nature, with banks on each side, of an altitude of more than one hundred feet. The basins, between the locks, are short. The village is on the heights.

The whole line of the canal, between Lock Port and Genesee river, is underlaid with rocks, lying but very little beneath the surface. In several places they emerge in bare masses.

There was no rock excavation of consequence between Genesee river and the lower end of Germanflats, above the Little Falls on the Mohawk. The limestone, gypsum and water limestone found were small cropings out, and opposed but small impediments. The beds of shale, indurated clay, marl, and hard pan, presented very formidable obstructions. These, however, were surmounted by the perseverance of the contractors.

About one mile of rocky excavation occurred half a mile westwardly of the Little Falls. As the surface, however, was even, and the excavation superficial, it was easily overcome.

At Little Falls, on the Mohawk, there were about two miles of rock excavation. It was on or near the side of the stream. The rock is mostly gneiss, and displays itself usually in solid masses, which now and then rise in picturesque and romantic forms. After Lock Port, Little Falls presented the greatest obstacles.

In Montgomery county, at Anthony's Nose, there was some rock excavation.

From this place to the Cohoos Falls, on the Mohawk, the rock excavation was very trifling. At the latter falls the canal,

for a short way, is carried through a rocky stratum. Over against the cataract the bed is sunk twenty-eight feet. The rocky layers dip at an angle of about seventy degrees. The lean is to the northwest. The laminae exhibit curved lines, and are considerable contorted. Between the Grand Junction and the Albany basin, the shistic rocks come very near the surface. Hence the excavation had to be in them. The layers are waved and commonly perpendicular. The excavation, owing to their structure and fragile texture, was slow, laborious, difficult and expensive.

The shistic rocks are transition. The rocks at the Little Nose and the Little Falls, are primitive. Those at Lock Port, and eastwardly to near Rome, are secondary or alluvial. The latter are mostly between Syracuse and Oneida creek. Between Rome and the Hudson, they are nearly all, except those at the Little Falls and Little Nose, transition. Wake is the most prevalent between the lower aqueduct over the Mohawk, and Rome. Calcarious sandstone and some limestone also occured. The boulders are excluded as very few of them were in *situ*.

The Dugway, opposite to Herkimer and the Slip Hills, in Minden and Florida, are the principal hills on the line of the canal which are liable to avalanches. At these hills, in the spring, when the ground breaks up, and after heavy rains, large masses of earth, improperly denominated blue clay, become loosened and slide down into the canal. The numbers and magnitudes diminish as these hills acquire gradation of declivity. In half a century they will be of little or no moment. The greatest slips occurred upon cutting away the timber and removing portions of the hill sides.

The Champlain canal begins at White Hall, in the county of Washington, at the head of sloop navigation, on Lake Champlain, and extends south southwestwardly to the Hudson at the village of Fort Edward, two miles south of Sandy Hill, where it takes a southerly course along the valley of the Hudson, to the Grand Junction, eight miles and a-half north of the city of Albany. Here it unites with the Erie canal. Its course, till it has reached the Hudson, is up the valley of Wood creek to Fort Anne, and thence over the table land to the former stream.

There are six ascending and eleven descending locks.

The first group of ascending locks is at White Hall, where the canal begins. They amount to three, and have lifts which, in the aggregate, are ——— feet.

At the head of the last lock a level commences, which is eight miles and a half in length, and ends in a lock having a lift of only four feet.

The second level is three miles and an half in length—at its termination there are three locks, whose lifts united amount to ——— feet. Thus far the canal runs in the narrow rocky valley of Wood creek; here it enters upon the summit level between the latter stream and Hudson's river. The summit level is twelve miles long, and stops a little short of Fort Edward—the last six miles are through swampy lands. The canal descends into the valley of the Hudson by three locks, located in the same vicinity. A feeder taken out of the Hudson, a little above Fort Edward, supplies the summit level with water. Each lock has a descent of ten feet—the feeder is half a-mile long, and draws water from the great dam.

The Hudson is then used to Fort Miller, a distance of about eight miles. Here the canal leaves the river for half a mile. It is on the east side, and commences a little above a dam which has been thrown across the stream, and which sets the water back above Fort Edward. It has two locks where it re-enters the river with falls of ten feet each. The water is introduced from the dam through a guard lock—it then pursues the bed of the river about three miles, to the head of Saratoga Falls, where it crosses to the west side and leaves the river There is also a dam at this place—the water flows through a guard lock.

A little below Fort Miller bridge, a level begins of seventeen miles, it passes through Schuylerville, where the army of Burgoyne capitulated in October 1777. At the end of this level there is a lock of ten feet descent.

Four miles south there is one which has the same descent.

Rather over one mile below, there is another of the like descent.

Three miles south of the last, there are three locks, each of which falls ten feet—the last of the foregoing is about a mile and a-quarter north of the village of Waterford, in the county of Saratoga. From the foot of the latter lock, to the union of the Champlain canal with the Erie, is about three miles. At Waterford there is a branch which descends into the Hudson by three locks of ten feet fall each. The Champlain canal crosses the Mohawk a little north of the Grand Junction. The dam is five hundred and fifty yards in length, and seven feet in height—it is built of wood, and stands on the shistic rock which forms the floor of the river.

Connected with this canal are several dams—the first is the great dam above Fort Edward, which is nine hundred feet long, and twenty-seven high—it now supplies the summit level with water. The second is at Fort Miller, the third at Saratoga, and the fourth at Troy. The latter is eleven hundred feet long and nine feet high—it spreads the water above Waterford. Sloops ascend and descend through a lock on the east side of the river. This lock has an extent within the gates of one hundred and fourteen feet, with a breadth of thirty—the lift is nine feet.

The feeder, taken out of the Hudson two miles above Glen's Falls, is seven miles in length. Just below where the water issues out of the river, a dam has been erected which is twelve feet perpendicular elevation, and seven hundred and seventy feet in length. This feeder enters the summit level about a mile and a-half northeast of Fort Edward.

It is navigable for boats up to the village of Glen's Falls. Its course lies through an elevated plain whose surface declines towards the summit level, Hudson's river, and Half-way brook, the main branch of Wood creek.

The Champlain canal is sixty-four miles in length—in its original state forty-six miles and one-half were artificial, and seventeen and one-half natural. Wood creek is used six miles and a-half, and the Hudson eleven.

It was commenced in June 1818, and finished in September 1823. The expense was $875,000. In beauty and utility it

falls below the Erie. The acting commissioner or engineer, or both, from some unaccountable caprice, have made the locks one foot narrower than those of the Erie canal. The boats of the latter therefore cannot navigate it.

The Erie and Champlain canals are splendid monuments of the enterprise and skill of the citizens of this State. They will elicit the applause of future ages, and perpetuate the names of the promoters.

The period of navigation, at present, upon the Erie canal, is about two hundred and ten days in the year. As the continental forests are cut down, and the lands cultivated, the number of days will be augmented. The western and middle sections, comprising the space between Lake Erie and Utica, open about ten or twelve days earlier in the spring, and remain unclosed nearly as many days later in autumn, than the eastern. The climate west of Utica, apart from the natural situation of the country, is milder than it is east. Between Germanflats, in the county of Herkimer, and the Little Nose, in the county of Montgomery, the climate is severer than on any other part of the whole line. The extremes of Fall Hill and the Big Nose may be considered the demarcations. West and east of these the climate mitigates; the canal shuts first and opens last at these places. The snows are deeper and lie longer between these lines. These remarks are applied to the canal line, and are made from personal observations. The difference in the opening and shutting would be less were the canal on the north side of the valley, because there would be a southern aspect.

The greatest amount of descending transportation, provided the locks were all double, and provided one boat of forty tons descended every eight minutes, during the two hundred and ten days, would be 1,512,000 tons. The ascending tonnage, at present, is estimated at about one-eighth of the descending.

From the preceding it will be seen that the descending transportation cannot exceed a certain amount. The ascending transportation, it is nowise probable will ever equal the descending; but should it, it cannot exceed it. Both cannot exceed 3,024,000 tons—this is the maximum. The above computation

supposes the descent of one hundred and eighty boats, and the ascent of the same number, in twenty-four hours. It also supposes a very great increase of water: an increase which cannot be had on many parts of the line, without the construction of ponds and lakes for the retention of water in freshets—the computation, after all, is perhaps too high. It may be doubted whether, upon an average, all the locks can be passed in eight minutes. At Lock Port, in the county of Niagara, at Little Falls, in the county of Herkimer, at the nine locks, in the county of Albany, and at some other places the locks are so near one another, and the basins so short as to require more time. The want of room and the meeting of the horses prevent it. Again, two boats cannot pass by each other on any of the aqueducts. Several of these occasion interruptions of from five to ten minutes, as those over the Mohawk.

Those boats navigating the canal, which move at the rate of two miles, or two and a-half an hour, do very little damage to the banks and bottom; while those which move at the rate of four miles, occasion great deterioration. The velocity of the packet boats is about four miles an hour, and of others from two to three. A boat impelled four miles an hour agitates the water, and causes strong currents and considerable swells—these wash away the banks. This has been exemplified in a striking manner. In light soils, the banks soon after the introduction of these boats, became defaced, and such were the inroads in many places, that when two horses met they could scarcely pass. Facing the banks with stone will in a measure obviate the evil. This is already in part effected.

The greatest press of business on the Erie canal is in spring and fall. On the eastern section the press, on particular occasions is so great, that the boats cannot be passed so fast as they come. Hence there are delays, and the owners of boats are put to extra expenses. Doubling the locks might obviate this for a few years, but it would only be a partial remedy. The western country is populating rapidly. The Ohio canal is making, other canals will be made, these will occasion an increase of business on the Erie. A parallel canal, from the east end of the Long

level, carried down on the north side of the Mohawk, to Alexander's bridge, in the county of Schenectady, and an enlargement of the residue eastwardly, would remedy the whole evil.

The toll, or imposts, on the Erie and Champlain canals, in 1826, was seven hundred and sixty-two thousand, and three dollars, and sixty cents; and in 1827, eight hundred and fifty-nine thousand, and fifty eight dollars, and forty-eight cents. The reader will hold in rememberance that the Erie canal was finished about the middle of October 1825. The amount in 1828 is not inserted as the author could not procure it in time.

We shall close by giving an outline of the powers and duties of the commissioners, and by making some remarks.

The commissioners have power to determine upon all improvements, and all changes in the routs of the canals; to appoint resident engineers, superintendents, and weighers; and to dispose of the surplus waters, under certain restrictions. They have the entire control and management of the canals, with ample authority, and means of doing whatever may be necessary to keep them in a condition to be used, and which the public good may require. In them is vested the power of making such rules, regulations, and by-laws as may be necessary to preserve them and protect the public in the use of them, subject, nevertheless, to modifications and repeals by the legislature. All their proceedings are to be recorded in books, and to be accessible to inspection.

The commissioners, when not acting as a board, have the same extensive powers. These powers, however, are only exercised by such as have portions of the canals assigned to them. Every commssioner, to whom a portion is assigned, has the entire superintendance, and is responsible for keeping it in good condition, and for enforcing the rules and laws. Engineers, intendants, lock-tenders, weighers, and all other persons employed, are subject to his authority, and are required to yield implicit obedience to his mandates. He appoints lock-tenders, fixes their compensation, and removes them at pleasure. He may discharge engineers, intendants and weighers, for neglect of

duty, or improper behaviour, and appoint others till the next meeting of the board.

The citizens of this State owe a debt of gratitude to the promoters of the Erie canal. It is not our intention to speak in particular concerning them, lest it might seem invidious to some; but we cannot refrain from barely mentioning the names of two individuals, who appear to have been almost entirely forgotten: We allude to the Hon. Joshua Foreman, and the Hon. Jonas Platt. These gentlemen first brought the subject of the Erie canal before the legislature of this State; and procured the enactment of laws for examinations, surveys, drawings and reports. Judge Foreman brought the subject up on the eighth of February 1808, and obtained the passage of an act which led to an examination and report.—On the thirteenth day of March 1810, Judge Platt brought the subject up again, after it had lain dormant for some time, and had a law passed for further examinations, which resulted in the making of the canal. The same law provided a board of commissioners—a board that has given weight and consideration to all subsequent proceedings which have been had in relation to the Erie and other canals.

That party spirit which removed the late Gov. Clinton, one of the principal promoters of the Erie and Champlain canals, from the board, thereby rendering evil for good, did not think it expedient to abolish the board, however ungratefully it might deal with one of the benefactors of mankind.

OSWEGO CANAL.

THIS canal, when completed, will be about thirty-eight miles in length, including the branch at Salina. It may be said to commence at Syracuse, in the town of Salina, in the county of Onondaga, and to end at the mouth of Oswego river, on Lake Ontario. The branch which we have noticed under the head of the Erie canal, is two miles long, and unites the waters of the latter with those of Onondaga lake. The lake and its drain are embraced in the line. After reaching Seneca river

by the drain, it runs down that river, and Oswego, to its exit. The descent on the Salina branch, is thirty-eight feet, and from thence to Lake Ontario, one hundred and twenty-four, making in all one hundred and sixty-two feet.

The Oswego canal is in great forwardness, and will be finished in the course of the ensuing year (*i. e.*) 1829. The village of Oswego has been greatly enlarged since the commencement of this canal, and promises to be one of the largest in the western country.

SENECA CANAL.

THIS canal, which is nearly finished, begins at the foot of the declivity, on which the village of Geneva, in the county of Ontario, is built, and runs eastwardly along the north end of Seneca Lake, to the outlet, rather over two miles. From thence it continues down the outlet to the Montezuma marshes, about thirteen miles—here it turns and proceeds along the western margin of those marshes to the Erie canal, distant about five miles. The lockage is very nearly sixty feet. This canal, including Seneca Lake, will open a navigation of about fifty-two miles. The lands along its line, and around the lake, rank among the best in the State.

For further information in relation to our canals, we refer the reader to a work published by the State, in two volumes, comprising about 1,100 octavo pages, under the title of "*Canals of New-York.*" To this work we are indebted for many of the foregoing facts, such as resolutions, acts, contracts, &c. The "Canals of New-York" are documents published at full length. But as they are not condensed, methodised, and arranged in a systematic manner, few persons would take much interest in reading them in their present condition. Also, to Canals published by the Hon. Cadwallader D. Colden, of New-York.

HUDSON AND DELAWARE CANAL.

THIS canal begins at Eddy's landing, in the county of Ulster, on the Rundout river, and runs southwesterly up that stream, to the town of Wawarsing, where it quits it and follows one of its branches to the summit level, in the town of Mamakating, in the southeastern part of the county of Sullivan, still holding the same course. Here, after having traversed the summit, it descends to the Delaware, keeping along Basler's-kill and Neversink river. Thus far its direction is about southwest, its line being in two vallies. At the Delaware it changes its direction, and runs up that river about twenty miles, where it crosses over that stream into Pennsylvania, and keeps along the Lackawaxen, up to Honesdale, in Wayne county, at the reception of the Diberry, where it ends. Here it is superseded by a rail road, fifteen miles in length, which terminates at the coal mines. In this State its rout is through the counties of Ulster, Sullivan and Orange, and along the side of Sullivan. Its length is about one hundred and twenty-one miles, of which eighty-four are in this State. One hundred and six miles consist of canal, and fifteen of rail road. There are sixty stone locks between Eddy's landing and the Delaware river.

The summit level is five hundred and forty feet above the tide waters of the Hudson, and eighty above the low water mark of Delaware river, at the mouth of Neversink. The bed of the Delaware therefore, is four hundred and sixty feet higher than the surface of Hudson's river.

The total amount of rise and fall on the canal and rail-way, is said to be fourteen hundred and thirty-one feet. The width is twenty feet at the bottom, and thirty-two at the surface. The tow path is eight feet broad. It is navigated by boats carrying twenty-five tons.

This canal has been made by a company, at an expense of upwards of two millions of dollars. The main object which they have in view, is to supply the City of New-York,

and the towns along the tide waters of the Hudson with coal. The mines are said to be inexhaustable, and the coal of a superior quality.

This canal will open a new avenue for the inhabitants of Delaware and Sullivan, and those of the adjacent counties of Pennsylvania, to the New-York market. The rout is preferable to that down the Delaware to Philadelphia. The navigation of this river, unless in floods and freshets, is difficult. Even then the ascending is attended with great labour and expense. The inhabitants will give the preference to the former. Interest, ease and convenience will dictate this course.

In relation to the Hudson and Delaware canal I am under obligations to John Sudam, Esq. of Kingston, Ulster county, for some facts.

MORRIS CANAL.

THIS canal is one hundred miles and sixty-four chains in length, thirty-two feet in breadth at the top, and twenty at the bottom, and is to have a depth of four feet of water. It begins on the Delaware river, opposite to the village of Easton, in the State of Pennsylvania, and extends to Jersey city, on the Hudson, over against the city of New-York. It is entirely in the State of New-Jersey, and runs through the counties of Warren, Morris, Essex and Bergen. Its general courses are northeasterly to Andover, inclining some to the east, easterly to Paterson, southerly to Newark, and easterly, inclining some to the southeast, to Jersey city. From Hackensack river to Jersey city, or Powles Hook, its course through the Newark marshes, is very winding. This canal is divided into eastern and western great divisions. The former begins at Jersey city, and ends at the summit level, where the feeder from Hopatcong is introduced. The latter extends from the reception of the aforesaid feeder to the river Delaware. The feeder is three-quarters of a mile long, and Lake Hopatcong nines miles. Both are navigable. There are on the eastern division twelve inclined planes, surmounting a rise and fall of seven hundred and forty-three feet; and seven-

teen locks, surmounting one hundred and fifty-six feet, making in all eight hundred and ninety-nine feet. On the western division there are eleven inclined planes, surmounting six hundred and ninety-four feet, and six locks surmounting sixty feet, making seven hundred and fifty-four feet. The whole rise and fall, on the two divisions, amount to one thousand six hundred and fifty-three feet.

The Morris canal is owned by a company. It was commenced about the middle of July 1825, and will be finished in the course of this year (1829.) Its cost is estimated at about one million of dollars.

The Lehigh canal, which ends at Easton, on the west side of the Delaware, runs up the river Lehigh to the coal mines. A canal of only twelve miles from the Lehigh to the Susquehannah, for which a charter has been granted, will connect the Morris canal with the Susquehannah river. The Morris and Lehigh canals are joined by the Delaware river. The Morris canal is designed for boats carrying twenty-five tons. The structure of this canal will have a tendency of lowering the price of fuel at the city of New-York. It is calculated that the Lehigh coal can be afforded for five dollars a ton, which is about one half of what that article has usually sold for in this city. The boats that take coal from the Lehigh Mines, will deliver it at the doors of the consumers in the city of New-York. The Morris canal, in addition to opening a direct avenue to the coal mines, will open one to the numerous iron works and manufactories in the interior of New-Jersey. Much produce it is calculated will be brought on it to the New-York market.

For the information in relation to the Morris canal, I am indebted to the Hon. Cadwallader D. Colden, president of the Company, who furnished me with a map, report, and a written statement.

The navigation of the Hudson, canals, streams, and lakes now connected with it, &c.

This river is navigable for sloops, schooners, and other craft, carrying from ninety to one hundred and fifty tons, to the city of Troy, one hundred and fifty-one miles, and by means of the

dam and lock, at this place, to the village of Waterford, in the county of Saratoga, four miles higher, making in all one hundred and fifty-five miles. The tide flows to the dam. Its navigation may be set down as follows :—1. Ships of the largest dimensions ascend to Newburg, sixty miles.—2. Ships of five or six hundred tons ascend to the city of Hudson, and even five miles higher, one hundred and twenty miles.

3. Sloops ascend to Troy. Above the ship navigation the water shoals—bars also stretch across the stream. The principal bars are Winne's and the Overslaugh. The former is eight miles below the city of Albany, and the latter three.

These bars are annually enlarged by alluvions brought down by the stream, and threaten to destroy the navigation. Were a canal of ten miles extent, commencing at Albany, and extending down the valley, constructed with a depth of fourteen feet, vessels of two or three hundred tons might come up to Albany. The Hudson is remarkably straight. No river in the world, of equal length, presents greater facilities for commercial purposes.

The Champlain and Erie canals, which are joined to this noble river, at and near the head of its sloop navigation, unite it with Lake Champlain on the north, and Lake Erie, and the other great lakes, on the west.

The Champlain canal, which unites the navigable waters of the Hudson with those of Lake Champlain, is sixty-four miles long. Lake Champlain extends the navigation northerly one hundred and thirty miles, to St. Johns, on the river Sorel, in Lower Canada. Sloops and schooners, carrying from ninety to one hundred tons, are employed on it. The extent of navigation on this line then is three hundred and forty-five miles, and is made up as follows :—

1. The Hudson up to Waterford	155 miles.
2. The Champlain canal	60 do.
3. Lake Champlain	110 do.
4. The Sorel	20 do.
	Total, 345 miles.

The whole line stretches very nearly from south to north, and is uncommonly direct.

The Erie canal, which unites the navigation of the Hudson with Lake Erie, is three hundred and sixty-three miles in length. The Oswego and Seneca canals, which are now constructing, and very nearly completed, are branches. The first opens a communication with Onondaga lake, Seneca river, Oneida river, Oneida lake, and Lake Ontario. Its length is about thirty-eight miles. The extent of navigation, afforded by Oneida river and lake, is also about thirty-eight miles. Boats may ascend Chitteningo, Oneida, Fish and Wood creeks, streams falling into Oneida lake some miles.

Seneca river is boatable up to its forks at Montezuma, and by one of these into Cayuga lake; but as the Erie canal stretches along the river and crosses its forks, it will not be used to any considerable extent.

The Oswego canal, taken in connection with Seneca and Oneida rivers and lake, affords nearly one hundred and twenty miles of boat navigation.

The Seneca canal, including Seneca lake, affords about fifty-two miles.

Cayuga lake is thirty-six miles long. Its outlet and inlet prolong its navigation seven miles, making forty-three miles in all.

The navigation of Genesee river is joined to the Erie canal, by the Rochester feeder, which is two miles long. From the head of the feeder, boats in low water, ascend and descend about seventy miles, and in high water, or with a swell, about ninety. The boat navigation ceases at the falls at Nunda. By land, the distance from the Erie canal, is but fifty miles. In this part of its course Genesee is very crooked. A canal might be made to the head of the vale, through which the river winds at a moderate expense.

It has been proposed to construct a canal from the Erie, at Rochester, in the county of Munroe, up the vale of Genesee river, and the valley of Black creek, to where the waters of the

latter river, and those of Alleghany divide, and thence down Oil creek to Olean on the latter river. The extent is one hundred miles, and the estimated expence $875,000. The lockage is one thousand and fifty-nine feet.

It has been suggested by some that a canal might be made from the Erie up the vale and valley of Tonnawanta creek, to a summit between Cattaraugus lake and Lime lake, and thence through the vallies of Ichua and Olean creeks, to Olean Point, on the Alleghany. The distance is one hundred and two miles.

From Black Rock, where the Erie canal ends, Lake Erie affords an avenue for navigation of two hundred and seventy-five miles.

Detroit river, which enters at the head of the lake, is twenty-eight miles long.

St. Clair's lake is eighteen miles broad. It receives the waters of Lake Huron, and discharges them by Detroit river.

Huron river is twenty-six miles long. Detroit river, St. Clair lake, and Huron river are merely extensions of the same avenue. The same may be said of lakes Huron and Michigan.

From the entrance, into Lake Huron, to Point de Tour, at the inlet of Lake Superior is two hundred and fifty miles. The distance from the outlet of Lake Huron, to the mouth of Lake Michigan, is two hundred and sixty miles. From thence to the head of the lake, the estimated distance is two hundred and sixty more. The transit, from the head of this lake by the Chickago, into the Illinois and Mississippi, is easy: so it is from Green Bay by Fox and Ouisconsin rivers, into the Mississippi, higher up. The navigation from Black Rock to Point de Tour, and the head of Lake Michigan, is uninterrupted.

Recapitulation of such as are within the State, or very nearly so.

1.	The Hudson to Albany	145 miles.
2.	The same to Troy	151 do.
3.	Champlain Canal	64 do.
4.	Lake Champlain	110 do.

5. The Sorel	20	miles.
6. Erie Canal	363	do.
7. Oswego Canal, Seneca and Oneida rivers	120	do.
8. Seneca Canal and Lake	52	do.
9. Cayuga Lake, inlet and outlet	43	do.
10. Rochester feeder and Genesee river	90	do.
11. Hudson and Delaware Canal	106	do.

The rail road connected with it is 15 miles long.

Recapitulation of the Great Chain, &c.

1. From New-York to Albany	145	miles.
2. From Albany to Black Rock	363	do.
3. To Detroit River	275	do.
4. To Lake St. Clair	28	do.
5. Across Lake St. Clair	18	do.
6. To Lake Huron	26	do.
7. To Point de Tour	250	do.
8. To the mouth of Lake Michigan	260	do.
9. To the head of Lake Michigan	260	do.

Navigation of the Susquehannah and its confluents.

The whole of this river is navigable for boats, from Otsego lake, in the county of Otsego, in this State, to its mouth at the head of Chesapeak Bay, in the State of Maryland—to this we may add the lake which is eight miles. Both give an extent of four hundred miles. Otsego lake approaches within twelve miles of the Mohawk, at the head of the Little Falls, in the county of Herkimer. Of the navigation of the Susquehannah, about one hundred and thirty miles are in this State. This river crosses the boundary, between this State and Pennsylvania, three times.

The Chenango, a large branch of the Susquehannah, is boatable some way upwardly.

The Tioughnioga, which constitutes nearly one-half of the Chenango, is boatable up to Homer, in the county of Cortland.

The Tioga, or Chemung river, another large branch of the Susquehannah, and whose course is mostly in this State, is navigable for boats from its mouth upwardly, forty-five miles or more.

The Conhocton, and the Canisteo are wholly in this State—the former is boatable from its union with Tioga, thirty-five miles above Tioga Point, to Bath, in Steuben county, about twenty miles—the latter about thirty.

In order to navigate the Chenango, Tioughnioga, Tioga, Conhocton and Canisteo with loaded boats, there must be a small swell. The Tioga, however, may be ascended to the mouth of Conhocton, but it is attended with difficulty.

The Susquehannah itself, when low, is not passable upwardly with loaded boats, above the mouth of the Chenango. From this place it is navigable downwardly at all times, for Durham boats and batteaux. A small rise of the stream, however, is desirable.

Boats never ascend the lower part of the Susquehannah, comprising a distance of sixty or seventy miles, owing to the rocks, rapids, and velocity of the current. The ascending navigation is therefore from Columbia, in the State of Pennsylvania, above the rapids.

The Durham boats carry from twenty to forty tons, and draw from one to two feet of water. The batteaux carry from ten to twenty tons. There is another kind of craft used solely for descending the river, and its dependants, called an ark. Its tonage varies from twenty to seventy tons. The structure is slight and rude. Arks are abandoned upon the disposition of the freight or cargo.

The Susquehannah has no perpendicular falls—the only impediments from Chenango Point, in this State, to the rapids at Columbia, in Pennsylvania, are several rifts which are by no means insignificant. These, however, are passed without much difficulty. The same may be said of the rifts upon its auxiliaries under consideration.

The boatable parts of Susquehannah river might be connected with the canal at a number of points. We shall enumerate four.

The first is from the head of Otsego lake, in Otsego county, to the canal at Minden, in the county of Montgomery. The line does not differ much from twenty miles. It would have to be by a rail road, as there is not water to supply a canal. The ascent from Minden to Summit Pond, in Springfield, Otsego county, is one thousand and forty-eight feet, and the descent to Otsego lake, one hundred and fifty-eight.

The descent from Otsego lake to Chenango Point is three hundred and fifty-three feet.

The second is from the Susquehannah, at the mouth of Chenango river, to the Erie canal, between Utica and Whitesborough, in the county of Oneida, or some place near by. The distance by the valleys of Chenango river and Oriskinny creek, including the summit level, does not differ much from one hundred miles. The ascending and descending lockage is about one thousand and thirty-two feet. The expense has been estimated at about $715,000. The rout is practable, and it would seem to be interest of the State to construct a canal. Considerable of the trade which now centers at Baltimore, would be diverted to the city of New-York.*

The third rout is along Owego or Cayuta creek, waters of the Susquehannah, to the village of Ithica, at the head of Cayuga lake, in Tompkins county. The distance on either rout does not vary much from thirty miles.† The rout between Ithica and Owego is now the thoroughfare of a considerable commerce in gypsum, salt, and other commodities. This rout would have to be mostly a rail way.

The fourth rout is either from Newton, on Tioga river, in the county of Tioga, up Elmira creek, and thence down into Seneca lake, or from the same river at a certain pond to the same lake.

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*A survey has been made from the Erie canal, up Onondaga creek, and through the valley of Tulley lakes or ponds, to Port Watson, on Tioughnioga river at Homer, in Cortland county. The distance is thirty miles, and the lockage seven hundred and ninety-five feet. The whole excavation, including feeders, would be forty-seven miles. The cost is put down at $432,000.

†The rout along the valleys of Owego and Mud creeks, to near the mouth of Cascadilla, at the head of the lake, is thirty-one miles, and the lockage seven hundred and sixty feet. The estimated expense is $320,000.

The distance on the line of the former is about twenty miles. That on the latter is greater, without taking into estimation a feeder from Conhocton river. The latter, however, has the preference in respect of water. The lockage is five hundred and twenty feet, and the expense is estimated at $407,600. The length of the canal is eighteen miles, and that of the feeder thirteen and a half.

A canal will in all probability be constructed in a few years. The Seneca canal, which is intended to unite Seneca lake with the Erie canal, at the Montezuma marshes, will soon be finished. This will open the navigation to the head of the lake, a distance of about fifty-two miles, and within twenty miles of Tioga and Conhocton rivers.

Canandaigua river and lake. The ascent from Lyons, on the Erie canal, to Canandaigua lake, is two hundred and sixty feet. The rout along the river, by its tortuous valley, exceeds thirty miles. Much has been said about opening a canal, but nothing has been done beyond taking a survey. The State is not yet disposed to engage, and individuals whom it most concerns, do not consider themselves able. The main obstacle in the way is the expense of making so many locks. The excavation would be easy. Water is abundant.

Navigation of the Alleghany River, &c.

In spring and fall floods, and generally speaking, whenever this river is swelled, boats may navigate it from Olean, in Cattaraugus county, to Pittsburg, in the State of Pennsylvania, about two hundred and twenty miles. The current, when it is considerably raised, is strong. There are no falls. Boat navigation on this river is attended with some hazard occasioned by numerous rocks lying in the stream, most of which are supposed to have rolled down from the bordering hills. During July, August and September, to which, in some years, we might add October, there is such a scarcity of water that loaded boats cannot descend or ascend unless by accidental rises. This evil will be greatly heightened by clearing the lands and draining them.

The Conewango, a branch of the Alleghany, is boatable in swells from its mouth to its union with Chatauque outlet, in Chatauque county. Above the union the navigation is continued to its source in Cosdaga lake. Boats also ascend into Chatauque lake, and thence to its head at Mayville. The distance from this place to the mouth of Conewango, by water, is computed at forty miles. By means of these streams and the lakes out of which they issue, boats approach within six or seven miles of Lake Erie. Between the head of Cosdaga lake and the navigable waters of the Canada-way, a small stream descending into Lake Erie, there is a short portage. In past times the Aganuschioni, and other children of the forests, used to carry their bark canoes from the navigable waters of the one to those of the other. Our people do not use it. The outlet of Cosdaga lake is not passable for boats unless swelled. An eastern branch of the Conewango, considered by some as the main stream, is navigable in freshets some way. Its bed is tortuous.

The proposed canal, from Lake Erie to the head of Chatauque lake, is in extent ten miles and a-half, and the estimated expense $400,000. The lockage is seven hundred and twenty-four feet. The rout begins at Portland on the former lake.

It has been proposed to make a canal by the Conewango, from Alleghany river to Buffalo, a distance of ninety miles. The lockage is eight hundred and fifty-six feet, and the computed expense about $503,000.

We scarcely need mention that the Ohio is a continuation of the Alleghany, and that boats leaving Olean in this State may descend to the Mississippi, and thence to New-Orleans, or after reaching the latter, they may ascend to the falls of St. Anthony, or by the Missouri to the rocky mountains. From Olean to the Mississippi is about eleven hundred and seventy miles. It is not likely that the navigation will ever be used by our citizens to any considerable extent. The distance, and especially the scarcity of water between Olean and Pittsburg, at the junction of the Alleghany and Monongahelia, are formidable obstacles. Besides the Erie canal offers a shorter and cheaper

rout for commerce. The New-York market is preferable to all others.

Buffalo creek, in the county of Erie, is boatable about eight miles. Its mouth, within the bars, at the village of Buffalo constitutes a good harbour.

The Niagara river is navigable for steam, and other large boats, from Lake Erie to within two miles of the famous falls. On approaching the rapids above the falls, caution is required. The distance is eighteen miles, and the descent fifteen feet.

The lower part of this river is navigable for such vessels as are used upon Lake Ontario, up to Lewistown, seven miles. The depth of water is sufficient to float ships.

The Tonnawanta, which falls into the Niagara opposite Grand Isle, is boatable to near the southern steep, thirty miles. The removal of the alluvial bars would improve the navigation of this stream.

Vessels drawing about eight feet of water ascend Genesse river to Falltown, three miles and a-half, where the navigation is stopped by the rapids below Carthage falls.

St. Lawrence River, &c.

This river affords good navigation for lake vessels, from its exit out of Lake Ontario, to Ogdensburg, at the mouth of Oswegatchie river, about sixty miles. The distance from Lewistown, on Niagara river, to the latter place, is about 217 miles. The rout is open from the middle of April to November, in ordinary years.

From Ogdensburg to Montreal, some where about one hundred and thirty miles, it is only navigable for boats and rafts. This distance is divisible into two parts. The first is between Ogdensburg and the mouth of St. Regis, and contains several tremendous rapids. The second is between the latter place and Montreal. In the former, boats of about twenty tons are used. In the latter, much larger, the depth of water admitting boats of seven or eight feet draft. In ascending the rapids the

boats have to be towed or warped up with ropes. A canal would obviate these difficulties.

The St. Lawrence, from Montreal to Quebec, one hundred and seventy miles, and from thence to the ocean, three hundred and twenty, is navigable for ships. Between Lake Ontario and Montreal it is a very uniform stream.

The Oswegatchie, a water of the St. Lawrence, and wholly within this State, is boatable up to the village of De Kalb, twenty or twenty-five miles. In freshets boats pass to and from the the river Grass, into the Oswegatchie, by the natural canal.

Indian river, which enters the Oswegatchie about five miles above Ogdensburg, is navigable for boats of ten or twelve tons, into Black lake, a sheet of water twenty miles in extent, and thence to the falls near its head. The falls are at Rossie. Above these the navigation is resumed to the next falls.

The Racket, another water of the St. Lawrence, is navigable for boats of five or six tons, about eighteen miles, to a small village called Louisville, where it is suspended by falls. It is said to be resumed about thirty miles higher up.

Salmon river of St. Lawrence, allows the ascension of boats carrying eight or ten tons, up to French-mills, nine or ten miles.

Montreal is, and always will be, the natural mart for the productions of our counties on the river St. Lawrence.

Black river, which falls into Chaumont bay, an arm of Lake Ontario, offers few facilities to boat navigation apart from canals. From its mouth up to Wilna, at the head of the Long Falls, it is altogether impracticable on account of falls. Wilna is in Jefferson county. At the head of the falls at this place, a very good boat navigation begins, and extends upwardly, to the foot of the high falls, about forty-seven miles by the streams bed. In ordinary times, the whole of this is slack water or what comes very near it. Above the high falls, there is no boat navigation owing to declivity and diminution of water. The navigation of this river might be extended from the head of the falls at Wilna, to its mouth, by means of short canals and locks.

In this place we think it not amiss to introduce a few words, in relation to the proposed Black river canal.

The proposed rout commences at the Erie canal, a little above the junction of West Canada creek with the Mohawk, and proceeds up the valley of the latter creek, sixteen or eighteen miles, where it turns to the right, and passes through the town of Russia, in the county of Herkimer, leaving the noted Trenton falls a short way to the left, into the town of Remsen, in the county of Oneida, from whence it continues to the summit level, in the latter town, situated between the latter stream and Black river. The summit level is two or three miles east of the road leading from the town of Utica, in the county of Oneida, to the village of Lowville, in the county of Lewis. From this point the rout descends into the valley of Black river, and follows that stream to Wilna, or somewhere in its vicinity, where it diverges leaving that stream and its valley, and crosses over to Indian river. After reaching this river it follows it down to Black lake, and thence by that lake's issue, to Ogdensburg on the St. Lawrence, at the mouth of the Oswegatchie. The entire extent of the rout does not materially vary from one hundred and sixty miles. The lockage would be about one thousand eight hundred and thirty feet. The ascent from the Erie canal to the summit level, in Remsen, is eight hundred and forty feet, and the descent from thence to the river St. Lawrence, nine hundred and ninety feet. These data are given from a survey made by Mr. Geddes, (whom we have had occasion to name more than once, and whose name is identified with the Erie canal) in 1825. The excavation, independant of a feeder for the summit level, nine or ten miles long, would not run over seventy miles. The other ninety miles are natural, that is, the beds of Black and Indian rivers, and Black lake, &c. might be used. The excavations of moment are between the Erie canal and the high falls on Black river, and between the town of Wilna and Indian river. A word in relation to the proposed rout—too much has been asked of the State. A canal, to be beneficial, ought to stop at Wilna, at the head of the long falls.

RAIL ROADS.

THE first account that we have of rail roads, is that of Newcastle, in England, constructed in 1602. From that period to the commencement of the present century, rail roads seem to have been neglected. At that time, several enterprising individuals in Great Britain, directed their attention towards the subject, and caused an additional rail road to that at Newcastle, to be constructed. Since then, numbers have been made in the United Kingdoms of Great Britain and Ireland. On some the carriages are moved by horses, and on others by steam.

In the State of New-York, much has been said on the subject, but no rail roads have as yet been constructed The Hon. Stephen Van Rensellaer, and some others, in 1826. procured the enactment of a law to make one from the city of Schenectady to the city of Albany. Since then an act has been passed authorising the making of a rail way from Catskill, on the Hudson, to Ithica, on Fall creek, at the head of Cayuga Lake. These roads, should they be made, are to be constructed by companies, the State taking no interest in them. The practibility of constructing both seems to be conceded. The expense of the latter is estimated at $1,500,000.

The inhabitants of Broome and Otsego, and those in the southwesterly part of Montgomery, have had in contemplation, a communication by means of rail ways, and slack water navigation, from Fort Plain on the Mohawk, to the coal mines of Belmont, in Pennsylvania. The distance from Fort Plain to the coal mines of Belmont, is about one hundred and thirty-six miles, by the rout. We will give the distances, ascents and descents : First, the distance from Fort Plain, to the head of Otsego lake, by the proposed rout, is some over twenty miles. The ascent from the Erie canal, at Fort Plain, to Summit Pond, in Springfield, Otsego county, is ten hundred and forty-eight feet : Second, from thence to Otsego lake, the descent is one hundred and fifty-eight feet. This part of the communication would have to be a rail road, as there is not water for a canal : Third, the dis-

tance from the head of Otsego lake, to Pennsylvania, is ninety-one miles, and the descent two hundred and ninety-two feet. This part would consist of navigation. Thirty dams with locks would have to be constructed on the Susquehannah: Fourth, the distance from the river Susquehannah, to the coal mines, is twenty-five miles, and the ascent and descent eleven hundred feet. In the first ten miles the ascent is eight hundred feet, and in the residue, which is fifteen miles, the descent is three hundred feet.

Table of elevations and depressions.

From Fort Plain to Summit Pond	1048	feet ascent.
do. Summit Pond to Otsego Lake	158	" descent.
do. Head of Otsego lake to Pennsy.	292	" do.
do. Thence to the Summit	800	" ascent.
do. The Summit to the coal mines	300	" descent.
Total	2,598	feet.

It has been proposed to make a rail way from Utica to Chenango Point. The rout is up the valley of the Oriskinney, and down that of the Chenango. Rail roads have been spoken of from Auburn, and Canandaigua, to the Erie canal.

In Pennsylvania several rail roads have been made, and have been found to answer very valuable purposes. On a rail way, a single horse will draw, in a waggon, about fifteen tons at the rate of two miles an hour, which is about half as much as a horse can draw in a boat on the Erie canal in the same time, or about one-sixth of what a single horse draws on the canal of Languedoc.

The distance from Ithica to Catskill is about one hundred and sixty miles. From Chenango Point to Utica is not over one hundred miles by the rout. Auburn is distant from the Erie canal seven miles. The constructing of rail roads from Catskill to Ithica, and from Utica to Chenango Point, would occasion the rise of villages, and tend to populate those sections of the State through which they passed. The making of the Erie and other canals have had this tendency. Lock Port, Brock Port, Rochester, Pittsford, Bucksville, Weeds Port,

Jordons Port, Geddesburg, Syracuse, Canestota, &c. have sprung up since the Erie canal was begun. Such are the effects of internal improvements.

OHIO CANAL.

THIS canal, when completed, including its feeders, will be three hundred and twenty miles in length. Its breadth is forty feet at the surface, and its depth four feet. The locks are ninety feet long, within the gates, and fifteen in breadth. It commences at Cleaveland, on Lake Erie, at the mouth of the Cuyahoga river, and ends near Portsmouth, on the river Ohio, extending throughout the State, in a winding direction. The amount of lockage is eleven hundred and eighty-five feet. From the Ohio river on the south, to the elevated plain separating the streams that fall into the Ohio, from those that run into Lake Erie, the lockage is ascending, and from that plain, in the main, descending. This canal is in great forwardness, and will, in all probability, be finished in the course of two years. This splendid work reflects great honor on the enterprise of the citizens of this infant State—we say infant, because this State has been erected since 1802. In 1800, its population did not exceed five thousand. At present it cannot fall much short of eight hundred thousand. Ohio, although an inland State, is one of the most important in the union. It contains more cultivable lands, in proportion to its extent, than any other State in the confederation. New-York is the emporium for its surplus produce.

WELLAND CANAL.

THIS canal is in the Province of Upper Canada, and is designed to connect the navigation of lakes Erie and Ontario. It begins on the northwest side of Lake Erie, at the mouth of Grand or Ouse river, about forty miles southwesterly of the village of Buffalo, in this State, and runs up that river a mile and a-half, keeping its bed, when it leaves it and runs northwardly fifteen

miles and a-half, to the little river Chippewa. It then runs down that river fourteen miles, where it turns from it and takes a northerly direction to Lake Ontario, sixteen miles. Its length is forty-seven miles, and its course across two plains, the upper and the lower. Its breadth at the top is sixty feet, and at the bottom forty, and its depth ten feet and a-half. Vessels carrying two hundred tons will be able to navigate it when finished. The lockage is about three hundred and thirty feet. The actual excavation will be thirty miles and a-half. This canal is in a state of great forwardness, and promises to be of great utility to the people of Upper Canada. Should the citizens of this Province, and those of the Lower, make a canal from Prescott, which is in the vicinity of Ogdensburg, in this State, to the head of Lake St. Francis, which is not much over forty miles, there would be an uninterrupted water communication for lake vessels from St. Mary's river, which is the outlet of Lake Superior, to Montreal.

CHAPTER VIII.

FALLS.

The celebrated Cohoos Falls are on the Mohawk, a mile and a-half above its mouths, or the sprouts, as they are called, and nearly the same distance westwardly of the vallage of Waterford, in the county of Saratoga. The descent of the cataract is seventy-eight feet, and at an angle of about seventy degrees. Above the pitch, the bank on the left side of the river, is ninety or one hundred feet perpendicular elevation, and below one hundred and seventy. On the south side, the bank above the pitch is low, but below eighty or ninety feet. Below the falls the river flows for a short distance in a deep rocky ravine. In floods and rises the whole bed, at the falls, is covered with water, which descends in one sheet. The width is about nine hundred feet. A fine view of the falls, and the romantic and picturesque scenery around them, may be had from the bridge over the river, half a mile below. The high barriers of rocks which confine the stream, the roar of the cataract, the dashing of the troubled waters, as they descend in rapids beneath you, and the striking contrast of the torrent with the wildness of the scenery above, combine in rendering the whole an unusual scene of sublimity.

The Erie canal runs on the south side of the river, passing close by the falls; but they cannot be seen from it, owing to its depth, which is twenty-eight feet. The traveller, however, by leaving the boat, and going on foot a short distance, may have a splendid view from the towing path.

The bed and banks of the Mohawk, are slate, from its mouth upwardly, fifteen miles. The layers, at the falls, dip towards the Hudson, and lean from it, at an angle of seventy degrees,

which gives them nearly a verticle position. The layers are thin, waved and contorted.

Falls on the Chuchtononeda.

The Chuchtononeda, in the town of Amsterdam, in the county of Montgomery, descends one hundred and twenty feet in eighty rods, forming in its way a series of beautiful cascades. They begin on the brink of the declivity of the river hill. When the stream is low, it sinks below these falls, and runs in a subteranean duct.

Falls on East Canada Creek.

These interesting falls are in the towns of Manheim and Oppenheim, seven miles easterly from the Little Falls, on the Mohawk, and one mile northerly of the river road, leading from Albany to Utica. Six may be dignified with the name of cataracts. The creek's bed and banks are composed of limestone, disposed in horizontal layers. The falls, with the intermediate rapids, occupy about three quarters of a mile. The stream, from their head to their feet, gradually narrows, its current gaining velocity at every step. The banks are at first low, but at last seventy or eighty feet high. Towards the foot of the falls they are either precipitous or perpendicular. They are now bare, and then studded with trees. These falls can only be seen to advantage when the stream is low, as there is no passing along them without frequent interruptions. In floods the water shoots down them with great velocity. They possess no unusual grandeur. The descent, in three quarters of a mile, is estimated at one hundred and eighty feet.

Little Falls.

These falls are on the Mohawk, in the county of Herkimer, seventy-one miles west northwest of Albany. The water de-

scends forty-two feet in three quarters of a mile. These falls, properly speaking, consist of two long rapids, separated by a stretch of deep water. Each occupies about a quarter of a mile. The splendid acqueduct of the feeder to the Erie canal, at this place, crosses the stretch, disparting the rapids. The upper falls, or rapids, are the most considerable. The bed of the river, which is granite and gneiss, is bristled with fixed rocks, which at times rise above the water. The lower rapids are also bristled with the same kinds of rocks. The river, just above these rapids, divides and forms a small island, but the parts unite below in a deep basin.

The scenery is bold and romantic. Fall Hill, whose nucleus consists mostly of granite and gneiss, seems in ancient days to have been united, and to have elevated the waters far above where they now run. The hill, on either side, rises from three hundred and sixty to four hundred feet. The defile is two miles long, and at a medium, one hundred rods broad. Through this defile, it is highly conjecturable, a portion of the waters of Lake Ontario, before the reduction of the lake's circumference and surface, flowed. A mound, of the height of seventy feet, constructed across the upper end of the defile, would now raise the waters more than on a level with the Rome summit, and divert them into Wood creek and Oneida lake. That Fall Hill has been cut down to its base by running waters, is incontestibly demonstrated, by the very many cavities, basins and scars found in and on the rocks, that pave the bottom and form the sides of the defile. These are to be seen throughout its extent, and to an elevation of sixty feet. Below the gulf bridge, on the north side of the road, at a short distance, there is an insulated rock, that has one of the most remarkable water-worn cavities, or funnels we ever saw. The top of the funnel is between thirty and forty feet higher than the low water mark of the river. The rock containing this tunnel, is about sixteen feet high. The tunnel descends perpendicularly from the top of the rock to below the exposed part of its base, and has the diameter of a barrel. Near the base of the rock, it has been burst or broken, so that the sky may be seen, as from the throat

of a chimney. The burst or rupture was occasioned, it is likely, in consequence of water congealing, which had collected in it, and the subsequent explosion of the ice. Other cases might be cited, but they would swell this article too much. The river, at the foot of the falls, expands into a basin, and then contracts, and afterwards spreads. At the narrowest place, where the water is about one hundred feet deep, fixed rocks in the stream rise above the surface during low water. There are two islands in the defile. The upper is in the lower rapids, between the branches. The other is below, and begins at the basin. The river is now on one side, and the canal on the other. Its bed is about fourteen feet above the river's present bed. On making the canal along this forsaken bed, many rocks were removed, which had water-worn cavities. Indeed the rocks along the sides of the island, have abundance of these cavities.

After the reduction of Lake Ontario, and the subsequent reduction of the lake that overspread the Oneida and Senaca vale, there must have been a lake that spread back to Rome. This lake decreased, as the barrier at Little Falls gave way to the waters, till it became desiccated.

Trenton Falls.

These renowned Falls are on West Canada creek, between twenty-two and twenty-four miles above its confluence with the Mohawk. The West Canada creek is a powerful stream, and constitutes almost one half of the river at the coalescence. They commence a little above the high bridge on the Black river road, and terminate at Conrad's mills, occupying an extent of rather over two miles. They are six in number.

The West Canada creek, in its way from the summit of the highlands of Black river, to its lower valley, lying between the latter and Hassenclever mountain, crosses a ridge of limestone four or five miles in breadth, stretching through the country from the Mohawk to the St. Lawrence. Its course over this ridge, by its tortuous bed, is six or seven miles, two and a half of which are above the falls. The waters of the creek soon

after they have reached the limestone, move with accelerated strides over the naked rocks, to the head of the upper fall, where they are precipitated eighteen or twenty feet down an abrupt ledge into a spacious basin. The whole descent, to the head of this fall, in the last two miles, is computed at sixty feet. Here a deep and winding ravine begins, which extends down the stream more than two miles. Its average depth is estimated at one hundred feet, and its average breadth at the top at two hundred. In some places the depth and width are more, and in others less.—The sides and bottom consist of limestone, disposed in horizontal layers, varying in thickness from some inches to a foot and upwards. The layers are often thin and slaty, and abound with organic remains. The sides of the ravine are shelving, perpendicular and overhanging. In many places large masses of rocks project over the stream and threaten to tumble down into it.—The sides of the ravine are partly bare and partly covered with trees, such as hemlocks, cedars, &c. Some of these that have taken root in the fissures of the rocks are now pendant over the abyss, where they form the most fanciful appearances imaginable. The country along, and neighbouring the ravine, descends to the south, and is mostly covered with woods which exclude every appearance till you arrive upon the very verge. There are four falls in the ravine, and one at its head, and one at its foot, making in all, six. That above the high bridge on Black river road, may be called the Upper Fall, and that at the end of the ravine, Conrad's Fall. The first in the ravine is a mile below the high bridge, and is denominated the Cascades. The second, which is a little lower down, is called the Mill Dam Fall. The third, by way of eminence, are called the High Falls, they are forty rods below the preceding. The fourth is nearly seventy rods below the high falls, and is called Sherman's Fall. All these falls are formed by solid reefs of rocks which cross the bed of the stream.

The water at the Upper Fall descends eighteen or twenty feet perpendicularly. The width of the creek does not vary much from eighty yards. Below there is a capacious basin, out of which the stream issues, in a diminished bed, into the ra-

vine. The entrance is between lofty barriers of rocks. This fall, when viewed from the bridge, has a fine appearance. It also appears to good advantage from the high ground west of the creek, and the flat at the basin.

At the Cascades the water falls eighteen feet. The Cascades consist of two pitches with intervening rapids. The bed of the stream is contracted, and the sides serrated. The banks of the ravine rise with abruptness almost directly in the rear.—The basin below has considerable depth, and is greatly agitated in floods.

The Mill Dam Fall, which is the second within the ravine, has an arbupt descent of fourteen feet. The stream is about sixty yards broad at the break.

The High Falls are forty rods below the latter. The whole descent is one hundred and nine feet. The High Falls consist of three distinct falls, with intervening slopes and some small pitches. The first has a perpendicular descent of forty-eight feet; its line is somewhat irregular; in floods and rises the water covers the whole break, and descends in one sheet, but at other times mostly in two grooves, at the west side of the fall. The stream at this place is about fifty yards wide. The second has a descent of about eleven feet. The third has a descent of thirty seven feet. The three, including the slopes and pitches, have a descent of one hundred and nine feet. The stream narrows at the second and third. In freshets and floods the entire bed, at the High Falls, is covered with water of a milk white colour. The spray, which at such times ascends in pillars towards the sky, when acted upon by the rays of the sun, exhibits the rainbow in all its brilliant colours.

The fourth fall is Sherman's Fall. It is distant nearly seventy rods from the High Falls. The descent is thirty-three feet when the stream is low, and thirty-seven when high. In droughts the water pitches down at the west side.

The last fall is at Conrad's mills, at the very foot of the ravine. It is irregular, and does not deserve to be noticed any further than its being connected with the others. Its descent is six feet.

Besides the falls, there are several raceways or chutes. We shall notice only two of these. The one is below Sherman's Fall, and the other above the Cascades. The first begins near the foot of Sherman's stairway, and is fourteen or fifteen feet wide, in a decreased state of the stream. It is bounded by firm rocks. A strand stretching along the west side affords an agreeable walk. This raceway, in dry times, is about ten rods long. In floods, it reaches almost up to Sherman's Fall, sixty rods.—The water runs through it very rapidly. The second, which is above the Cascades, is twenty rods long, and from ten to fifteen feet wide, in a moderate state of the stream. Its sides are somewhat trough shaped, and considerably jagged. The bed is contorted and highly inclined. The water rushes through it with great velocity.

The whole depression of the stream, from the top of the Upper Fall, above the high bridge, to the foot of Conrad's Fall, is three hundred and twelve feet. And if we add the descent above the Upper Fall, which is computed to be sixty feet, and that below Conrad's Fall, in half a-mile, which is estimated at fifteen feet, we shall find that the entire depression, in less than five miles, is three hundred and eighty-seven feet.*

The falls, raceways and rapids, and in truth, the whole bed within the ravine, exhibit very different appearances at different times. These are occasioned by the elevations and depressions of the stream. In floods, the whole is one tremendous rapid, with four cataracts and several chutes.

The best time to visit these falls is when the stream is low, because then there is no inconvenience or difficulty in ascending the ravine from the foot of Sherman's stairway, to the head of the upper raceway. Few persons who visit them have resolution to ascend the ravine from the bottom of Sherman's stair-

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* In relation to the entire descent, I am under special obligations to Mr. Stoddard Squires, of the town of Russia, in the county of Herkimer. This gentleman, in the spring of 1825, made admeasurements preparatory to Mr. Geddes, taking the levels, &c. between Ogdensburg and the Erie canal, and soon after communicated the result to me.

way, to the basin at the upper fall above the high bridge. This, however, is not to be wondered at, because the lofty rocky barriers which constitute the sides of the ravine, advance to the water's very edge, in many places, and terminate in frightful projections, which cannot be passed without the most imminent danger. Mr. Sherman has lately obviated some of the difficulties, by blasting away portions of the rocks and putting up chains. Persons now go up to the upper raceway without hazard.

The ravine, with some few exceptions, is still bordered by woods. No roads have hitherto been opened near it but Black river road, which crosses the upper part, and that leading to Mr. Sherman's house. All persons desirous of visiting the falls have therefore to go to his house, from whence they proceed to them through the woods, by some rude paths. One of these leads to the stairway, which descends to the bottom of the ravine. Another leads up to the high falls. The former is usually preferred. On reaching the strand at the foot of the stairway, you proceed up the stream at first upon the strand, and then by a narrow winding foot path, made by Mr. Sherman, and reach Sherman's Fall. From thence you advance to the High Falls. A part of the way is overhung by large jutting rocks which menace you with destruction. The High Falls appear to the best advantage from below, because the eye takes in the whole at once. From the head of the High Falls to the upper end of the raceway, above the Cascades, the way is easy when the stream is low, but from thence upwardly, it is difficult and dangerous.

While you are passing along the narrow and sinuous paths leading by the projections, and by the brinks of headlong precipices, you tremble with reverential awe when you consider that one false step might precipitate you into the resistless torrent below, and in an instant consign you to a watery grave.—You see what a feeble creature man is, and are forcibly impressed with ideas of the wisdom and power of that Mighty Being, who commanded the earth to emerge from the deep and the waters to flow.

Along the bottom and lower parts of the ravine, numerous organic remains are found enveloped in the rocks. The stone containing them is limestone. It is in general slaty and brittle, and is easily divisible. The remains lie flat in or between the laminæ, their contours and component parts usually being little distorted from their original shape and dimensions. Sometimes, however, there is defect, occasioned in the transition from the animal to the stony or fossil state In most instances, however, all the parts are so completely defined, that not only the order, but the genera and species may be recognized. These remains are easily separated from the layers in which they are enclosed. Their exteriors are commonly glossy, often very smooth, and ordinarily of a darkish or blackish colour, being considerably darker than the rocks enclosing them. All these remains are transformed into stone, and constitute integral parts of the rocks which envelop them. From a careful examination of certain of these remains, and their positions, we are led to believe that their prototypes lived and died on the spot, and that the rocks in which they are entombed, are of posterior formation. Century after century must have rolled away on the interminable ocean of time during the re-production, growth and destruction of these animals; and century after century must also have rolled away before the unconsolidated materials in which they were imbedded, or by which they were inhumed, could have been transformed into stone. Their prodigious numbers, and their being found in layer upon layer, announce the very slow manner in which these rocks were formed, and that a great length of time must have elapsed.

These rocks are secondary. Many rocks belonging to this class have been formed by the recrements of animals and the precipitation of earthy matters. Such appears to have been the course which nature adopted here. The presence of fossil remains here, as well as elsewhere, apparently demonstrates this mechanical and tedious process of formation.

At the times these animals lived, it is likely that the primeval ocean stood much higher than the present, and overspread nearly the whole surface of the earth. Then the greater part

of the two hemispheres were liquid plains. Then only the high table lands and mountains rose above the waters. The country around the head of the ravine is upwards of eleven hundred feet above the surface of the present ocean. To preserve animal relics entire, or nearly so, which is the condition of these, their originals, or prototypes must die in the places where they lived, and be preserved in the places where they died, and these places must be in deep water, where there is tranquillity or something approximating thereto, and equableness of temperature. Here, after death they become blended with the unconsolidated materials in which they were imbedded, or with other animal relics which had died before them, or both, and by and by they become inhumed, and secured from the destroying hand of time. It is in this way that turtles, aligators, fish, &c. have been preserved in the newer secondary rocks, shale, &c. They died in deep water, where there was stillness, or a state bordering on it, and uniformity of temperature, and in a short time they became enveloped in mud or in other terrene matter, which subsequently passed into stone, shale, &c.

On the confines of the present ocean, in certain situations, we see miniature specimens of these grand operations in progress. Oysters, clams, and many kinds of shell fish are to be seen in collections of water which have considerable repose and no great depth. The bottoms of these collections are often muddy—we see the testaceous animals alive and dead. The latter become blended with the mud, and afterwards covered by it. The covering secures them from the ravages of time. One generation perishes after another—the successive generations are buried one after another; and were there sufficient depth of water and duration of time before the dereliction, rocks would be formed which would contain many of these relics.

Great Falls on the Hudson.

These falls are in the town of Corinth, in the county of Saratoga, twenty miles north of Ballston Spa. The perpendicular descent is thirty feet. The rapids above, which extend

about a mile have a similar descent, making in all sixty feet. One hundred and twenty yards above the perpendicular fall, there is a remarkable sluice of twelve yards in length, and four in breadth, in a decreased state of the stream. The water shoots through it with great velocity. In freshets, the waters mount above it.

Glen's Falls.

These falls are three miles above the village of Sandy Hill, in the county of Washington. They are caused by a ridge of limestone that crosses the bed of the river. The abrupt descent is thirty-two feet, and the width of the stream about nine hundred. The rapids above are from fifteen to twenty feet. These falls in floods are covered, but in drouths the water makes its way down them in several grooves. There is a fine view of these falls and of the river below, from the bridge crossing the Hudson.

Baker's Falls.

These falls are also on the Hudson, but lower down, at Sandy Hill. They have no abrupt declivity, but consist of rapids extending about nine hundred feet, with a descent of sixty. In ordinary times, the waters of the river make their way down in winding crevices worn in the rocks. In floods the bed is covered, and the water rushes down with majestic grandeur.—These falls may be seen to advantage from either side of the river. Some prefer a rock on the east side which projects into the stream. The rock, which underlays the river, is transition slate.

The falls at Fort Miller, Saratoga and Stillwater, are too inconsiderable to claim particular attention. Before the construction of the Champlain canal rafts descended them.

High Falls on Batten Kill.

These falls are in the towns of Easton and Greenwich, in the county of Washington. The descent is abrupt, and about sixty feet. The quantity of water, in floods, renders them an object of curiosity.

Falls on Poesten Kill.

There are several falls on this stream in the last three miles of its course. The depression is about three hundred feet. Among these falls, those called Mount Ida, near Troy, have the greatest descent. In floods, these, with the intervening rapids, possess no unusual share of interest.

Hoosack Falls.

These falls are on Hoosack river, in the northeast corner of Rensellaer county. The water has a descent of about forty feet in twelve rods. They are distant from Troy, in a northeasterly direction, twenty-two miles.

The falls at Walden, on Walkill river, in Orange county, are between forty and fifty feet. They are ten or eleven miles west of Newburg.

Honk falls, on the Rundout, in the county of Ulster, have a perpendicular descent of thirty feet. The quantity of water is not considerable.

Adgate's Falls.

These are in the town of Chester, Essex county, on Sable river, some miles above where it enters Lake Champlain. The water descends about eighty feet. Directly below the stream contracts and flows through a deep ravine, bounded by mural rocks. The ravine is seventy feet wide where the road crosses it, and ninety deep exclusive of the water of the river. Along its banks the lands are level. The ravine is unique, the land being level on both sides.

Falls on Black River.

There are several falls on this river. The first are the High Falls, at Turin, in the county of Lewis. Here the water pitches down a limestone steep, sixty-three feet. A stretch of boatable water commences at the foot of these falls, and reaches to the head of the Long Falls, at Wilna. The High falls, in beauty and grandeur, surpass all the others on this river.

The second are called the Long Falls, but inaptly. These, with the reaches of slack water which intervene, occupy an extent of twelve or fourteen miles.

The first of these begin below Wilna bridge, and extend down the stream half a mile, and have a descent of sixty feet—they end in slack water.

The second are about four miles lower down, and are two miles in length. The descent, in this distance, is computed at one hundred feet.

The third are four or five miles below the preceding, and are inconsiderable.

The fourth are at Champion, in the county of Jefferson, and have an abrupt descent of twelve feet. The river just below narrows to seventy feet, and flows a short way through a kind of canal. The bank on the right is mural—the limestone is piled up in layers which have inimitable regularity.

The fifth are at Watertown, in the same county—they have a descent of fourteen feet. The stream below the cataract is confined between high rocky banks—above it glides swiftly over a limestone bottom.

Canady's cave is on the north side of the river, distant only a few rods.

The sixth are at Brownville, in the same county, near the mouth of the river—the descent is twenty-four feet, and abrupt.

All the foregoing falls are occasioned by reefs of limestone which cross the bed of the river.

In Denmark, Lewis county, there is a cascade on Deer creek, whose perpendicular descent is one hundred and seventy

feet. It is a short distance above where the stream falls into Black river. The banks below the cascade, for four or five hundred yards, are mural, and tower to the height of two hundred feet. In floods the cascade has a romantic appearance.

There are several other cascades on this creek, with falls of from ten to fifty feet. The rock is limestone.

The falls of Theresa, on Indian river, are about fifteen miles from the head of Black lake—the perpendicular descent is sixty feet. The rapids above have an extent of two miles.

The falls at Rossie, near where Indian river spreads into Black lake, have less descent. The river is boatable between these falls.

There are six cataracts on Oswegatchie river—the lowermost is in the town of De Kalb, in St. Lawrence county, between the natural canal and the Oxbow. It is twenty miles from these falls to the mouth of the river.

The next is at the Oxbow, in the town of Antwerp.

Grass river has its falls—in the town of Canton, are the High falls, four miles above the natural canal.

The second are eight miles higher.

The rest are above the latter.

The falls on Racket river, at Lewisville, twenty-four miles above its mouth, have a descent of fifteen feet. Small boats ascend the stream to these falls—above these there are several other falls.

The High falls on Chateaugue, near the four corners, form a beautiful cascade.

Orwell Falls.

These falls are in the town of Orwell, in the county of Oswego, on Salmon river—the descent, which is nearly perpendicular, is one hundred and seven feet. The stream is about sixty yards broad—at high water they are covered—the banks are rocky, and are nearly two hundred feet high below, and eighty or ninety above. Directly above the falls, there is a smooth expanse of boatable water.

Oswego falls, on the river of the same name, are midway between Lake Ontario, and the union of Seneca and Oneida rivers, and occupy an extent of three-quarters of a mile. They are to be considered rather as rapids than falls—there is, however, one descent of nine or ten feet, which is short and abrupt.

Red sandstone underlays the river and constitutes its banks.

Chitteningo Falls.

On Chitteningo creek, in Madison county, three miles northwardly from the village of Cazenovia, the water drops perpendicularly seventy-five or eighty feet. Limestone constitutes the bed and banks of the stream—the volume of water is inconsiderable.

Falls of Ithica.

These are on Fall creek, a main branch of Cayuga inlet, distant three-quarters of a mile from the rising village of Ithica. They amount to three.

The first has a descent of one hundred and sixteen feet: the second, distant twenty rods, has a fall of fifty feet: the third, a little higher up, has a descent of seventy feet—each has a perpendicular pitch.

The first, which is the lower fall, may be seen very advantageously from the bridge on the Auburn road, and from the side of a promontory—the views are strikingly grand.

Fall creek, in the last mile of its course, has a depression of four hundred and thirty-eight feet, two hundred and thirty-six of which are comprised in the Ithica falls—slate forms the bed and banks of Fall creek.

Seneca Falls.

These falls are on Seneca outlet, in Seneca county—they are inconsiderable, and have no abrupt pitches.

On the outlet of Crooked lake there are several falls. The outlet is about six miles long, and has a depression of two hundred and sixty-nine feet.

Genesee Falls.

These are five in number, three are in the county of Munroe, between the Erie canal and the ridge road.

The first is at Carthage, between five and six miles south of Lake Ontario: the second is about twenty-five rods above: the third is at Rochester, a-quarter of a mile below the canal aqueduct.

Besides these there are two rapids which aspire to the character of falls—the one is below the falls at Carthage, the other is at Rochester, and is crossed by the canal aqueduct.

The falls and rapids occupy an extent of three miles and a-half.

The two remaining falls are at Nunda, in the county of Alleghany. They are designated by the name of the Upper Falls. They are one mile apart—the first has a descent of ninety feet, and is at the head of boat navigation. The descent of the second is sixty feet. Below the former, the river rolls for ten miles through a deep, narrow, and crooked ravine.

We shall confine the residue of our description to the falls in the county of Munroe. In order to convey correct ideas of these, it will be necessary to advert to the topography of the country through which the Genesee runs. The whole is naturally divided into two parts, the upper and the lower. The former terminates at the foot of the Alleghany hills, ten miles north of Nunda. The latter, at the southern shore of Lake Ontario. The first is a mountainous and hilly tract: the second consists of plains and champaigns, and rises by easy gradations. A steep crosses the latter about nine miles south of the lake, and in some respects, subdivides it into two parts. The steep in the vicinity of the river is hardly visible—this steep, as far westwardly as Niagara county, detaches a branch.

which crosses the river between the canal and ridge road. The subdivision, lying north of the steep, rises, and attains an altitude of nearly three hundred feet above the surface of Lake Ontario. The subdivision, lying south, rises still higher, having an altitude of nearly or quite four hundred feet. The vale of Genesee is comprised in the latter. From this it will be seen, that the river, after it has emerged from the Alleghany hills, flows on the summit of an elevated plain, till it has passed the steep, two miles south of Rochester—here its current becomes more active, but it is still gentle for a mile, where rapids occur; these rapids, however, are boatable in swells, and the stream may be descended to Rochester.

The aqueduct of the Erie canal, at this place, is two hundred and seventy-one feet above the level of Lake Ontario.

The actual depression of Genesee river begins just above the aqueduct. Here long rapids occur, which are succeeded by swift running water. Both exceed five hundred yards. The swift running water ends in the falls at Rochester, which are ninety-seven feet perpendicular descent. A mile and a-half below this, the water descends at the second falls, about twenty feet. These falls are shelving. The Great Fall is at Carthage, about twenty-five rods lower down—here the water descends perpendicularly one hundred and six feet. The lower rapids are below these falls—they end at sloop navigation. The bed and banks of Genesee river, are limestone from the head of the rapids above the canal aqueduct, almost down to the great falls at Carthage, where they are sandstone. The whole distance from the falls at Rochester, to those at Carthage, is a narrow, deep, rocky ravine, having a depth of upwards of one hundred feet—the lands, on both sides, are very level, and have a descent towards Lake Ontario, which is made up by a steep and easy gradations. On approaching the river, above this ravine, and even on its sides, we see nothing indicative of a ravine, nothing indicative of a river and cataracts, before we reach its banks—extended plains appear on all sides: these appearances struck us very forcibly when we approached Rochester, from the side of Pittsford, and as we approached the ridge road, west of Car-

thage, on the side of Rochester. In travelling to the latter place, and from the latter place to the ridge road, the country had very nearly the appearance of a plain, the only interruptions were some gullies formed by small runs, which make their way to the river. Every thing under view, seemed to announce that the river, before it had delved out the deep ravine, through which it now makes its way, had flowed on the summit of this plain.

At the period when the river run on the summit of the plain, and before its waters had scooped out the ravine between Rochester and Carthage, the waters of Lake Ontario must have come up and stood as high as the ridge road, or ancient beach. Then the falls at Rochester must have been down near where those of Carthage are at present—they must also have had less elevation. The bed was then much higher, and the waters of the lake were near the foot of the falls. In the course of time, the falls, in consequence of the wearing down of the rocks by the waters receded step by step to where they are at present. The bed as the falls receded, became deeper and deeper, and narrower and narrower. The waters of Lake Ontario subsided during the same time, and the mouth of the river changed its place, and pursued them in their retreat. In the mean time, the falls of Carthage appeared, being disengaged from the waters of the lake, but they were below where they are at this day—like those at Rochester, they have ascended, and are still ascending the stream. The sandstone and limestone, which form the bottom and sides of the ravine, are slaty, divisible, and give way to the action of the waters and elements—then all the lands along the river, in these parts, must have been an almost uniform plain, with a trifling declination towards the bed of the stream. The bed, or course of the river, must have been much broader than it now is—the waters must have had much less celerity than they now have, on account of less declivity, impulse and concentration. As the bed, however, deepened, it acquired more declivity, and became narrower, and the waters being brought into a less compass, moved with increased velocity.

Whoever has passed along the Erie canal, must have noticed that it reaches the river on a level, and departs from it on a level, the aqueduct preserving the level over the stream. The top water line of the canal is lower than the surface of the river two miles above, as is demonstrated by the Genesee feeder. The banks of the river, above the rapids, at the aqueduct, are low. The Rochester level is sixty-three miles long. It extends from the foot of the heights at Lockport, to two miles east of Rochester, where it ends in a gentle declivity. We shall close by giving a table of the ascents of the falls, and the probable estimates of those of the rapids and stream from the lake, up to where the feeder is taken out of the river above Rochester.

1.	Ascent from the mouth of the river, up to the first rapids	3 feet.
2.	The rapids	
3.	The falls at Carthage	106 feet.
4.	Intermediate falls	20 do.
5.	Falls at Rochester	97 do.
6.	Intermediate ascents	
7.	Rapids at the aqueducts, &c.	15 do.
8.	Ascent up to the feeder	8 do.
	Those not carried out, including the descent of the bed, are estimated at	22 do.
	Total	271 feet.

Allen's, Oak Orchard and Tonnawanta creeks have severally falls—the falls on the two latter streams are occasioned by the steeps extending across the plain.

Falls of Niagara.

These celebrated falls are on the Niagara river, or strait, about fourteen miles from Lake Ontario, and about twenty miles from Lake Erie, computing the distance by the road which runs along, or very near the margin of the stream—the distance from Black Rock, at the outlet of Lake Erie, to Lake

Ontario, at the mouth of the river, is twenty-eight miles in a direct line. The bed of the river, from the outlet, down to the falls, is winding, but from thence pretty direct. The falls are very nearly midway between the two lakes.

Before we attempt a description of the falls, we shall take a cursory view of the extensive regions which contain the five great lakes. We do this for the better understanding, and obtaining juster ideas of these stupendous falls.

The regions containing the lakes comprise three plains which rise, one above another, like so many platforms. The first embraces Lake Ontario—the second, Lakes Erie, Huron and Michigan—and the third Lake Superior. The lower and middle plains, on the side of Lake Ontario, are separated by an elevated steep—this steep extends from the east side of Genesee river, westwardly to the head of Lake Ontario, where it turns, and proceeds north northwest. In this State it is from four to eight miles south of the lake. It holds a parallel course till it has reached the western extremity of the lake. It crosses Genesee river above the falls of Carthage, and Niagara at Lewistown. At first, its acclivity is gentle, by-and-by steep—its height at Lewistown, above the lower plain, is rather over two hundred feet. The plain, at the base of the heights, is one hundred and thirty feet higher than the surface of Lake Ontario, and two hundred and two feet lower than that of Lake Erie.

The space between the two lakes, which varies from twenty-one to thirty miles, where they approximate, presents two plains, the lower and the upper. The former commences on the southern shores of Lake Ontario, and extends southwardly to the steep: the latter commences at the brink of the steep, and extends southwardly to Lake Erie. The steep is composed of red sandstone, slate and limestone. The sandstone underlays the lower plain, and part of the upper. It is found in the lower parts of the ravine through which the Niagara flows, as far up as the falls. On the upper plain, limestone is the superior rock.

The Niagara, after issuing out of Lake Erie, runs on the summit of the upper plain to the falls, where it descends into a

deep ravine; it then pursues its way to the lower plain, at the base of the upper.

In the beginning, when the waters of this river began to flow, the falls were on the declivity of the steep at Lewistown, seven miles below where they are now. The ravine has been formed by the waters.

On approaching the falls, from Lewistown, the country exhibits little else than an extended level. The only interruptions are the ravine and the beds of some small streams. The river flows in the bottom of the ravine, which is on the right. It is now visible, and then not. A distant sound is heard in the south. This sound becomes louder and louder as you approach the falls, but you see nothing of them, nor any indication before you arrive within a mile and a-half. Here the ravine opens to full view, at the end of which you see the great fall very distinctly. You also see the spray ascending towards the heavens. The water in the ravine, runs with great rapidity. As you advance, you soon pass by and loose sight of the ravine and falls, and do not see them again before you reach them.

There are three distinct falls. The first is the lower fall. It is about two hundred and twenty yards broad. Its breadth is in some measure determined by Gen. Porter's bridge, which is a little above, and which is thirty-nine rods long—(about 214 paces.)

The second is the middle fall. It is separated from the preceding by a small island. Its breadth is seventy or eighty yards. A bridge in some measure also determins its breadth.

These falls are on the side of the ravine, and face Canada.

The third is the upper or great fall, situated at the head of the ravine. Goat island, containiug about seventy acres of land, divides it from the middle fall. It looks down the stream, and is shaped somewhat like a horse shoe. Its breadth is estimated at six hundred yards. The three falls, taken together, do not form a semicircle, as has been asserted by some.

Above the falls, for an extent of half a mile, the waters rush in two vast columns down a highly inclined plain. The se-

paration takes place at the upper end of Goat island. The beds are covered with breakers, occasioned by many crevices or grooves, worn in the rocks by the waters. On the northeast side of Goat island, the waters, owing to these brakers and their velocity, are nearly as white as soap suds. On the opposite side, where the volume is much greater, and where there are fewer brakers, their colour is more natural. Some have supposed that about seven-eighths of the waters of the river are precipitated over the great fall, and the residue over the middle and lower.

The waters do not descend perpendicularly, but shoot over like those of a mill dam. The sound caused by the fall of such immense bodies of water, is louder than that of the ocean in a tempest. The weight, impetuosity and descent of the waters occasion a tremulous motion all around. The doors of the houses in the adjoining hamlet, have slight oscillations. Goat island vibrates beneath your feet.

These falls are seen to the best advantage on the Canada side, at a place called Table Rock.

The ravine is seven miles in length, and ends at Lewistown. The waters of the river have formed it. Its sides, which consist of rocks, are mural. The rocks are perpendicular, retiring and overhanging.

Within the ravine there are several large ruins, which have been formed by the breaking off of portions of the walls. One of these extends from the foot of the great fall, some way down the stream. It resembles the debris at the base of the Palisadoes, on the west side of Hudson's river.

The descent of the rapids, above the falls has been computed by some at fifty-two feet, and by others at fifty-nine. The perpendicular descent of the great fall is estimated at one hundred and fifty feet, that of the others at one hundred and sixty-four. The difference arises in the difference of the length of the rapids. Those above the great falls are shortest, owing to the waters wearing faster at the pitch or break. The descent from the foot of the great fall, to Lewistown, is one hundred and four feet, very nearly fifteen feet to the mile. The

ascent from the head of the rapids up to Lake Erie, is fifteen feet, and the descent below Lewistown two feet. The aggregate of all these is three hundred and thirty-four feet.

The Niagara falls, in the winter, exhibit phenomena which they do not at other times. This was the case when we saw them. The weather had been cold for about eight days, but had then changed into a thaw. Great quantities of ice had formed in Lake Erie, but had not become fixed, except around the outlet. The loose floating ice driven out of the lake by a strong southwest wind, was descending in such abundance as to cover nearly or quite one half of the river. In passing down the rapids and the cataracts, it was broken into very small pieces. That which passed on the northeast side of Goat island was chopped very fine. The trunks and limbs of the trees, on the margin of the stream, were loaded with ice, made by the congelation of the spray. The ground was also covered with ice, which was a foot thick in some places. The spray, which ascends when the air is calm, or approaching to calmness, was beat down by the southwest wind, and confined chiefly to the ravine. The sun shone very bright. Its rays acted with efficacy on it, and produced all the vivid colours of the rainbow, without, however, producing the bow itself. We saw these colours from General Porter's bridges, and from Goat island. They appeared in succession, as we shifted our position. Nothing was wanting but arches to give them the appearance of rainbows. They extended across the ravine, and had declinations, occasioned by our superior position.

The river, above the rapids, widens. Its banks are very low all the way up to the steep at Black Rock. Between the falls and Tonnawanta they are generally not over eight or ten feet. Above they are somewhat higher. The ancient banks commence near Chippeway, and terminate a little below the falls. They are but a short distance in the rear of the present. At first they are low, but increase so much, that opposite the falls they have elevations of seventy or eighty feet. This apparant increase is occasioned by the depression of the bed of the stream above the perpendicular pitch, which is upwards of sixty feet,

in two miles and a-half. Behind the ancient banks the country is a plain. When the falls were some miles lower down the waters came up to the sides of these banks, as they now do above Chippeway, and presented a smooth surface. The bed of the stream, as the falls advance towards Lake Erie, contracts. The contraction is caused by the sinking of the bed, and the consequent contraction and acceleration of the current.

The whirlpool is on the west side of the river, about a mile and a-half below the falls. It is a kind of bay, containing a number of acres. The stream on reaching it, turns short to the left. Lofty rocks enclose it on all sides, except on one. Its shape is similar to a horse shoe, bent out considerably. It is remarkable for a powerful eddy, which carries into it most of the floating substances brought down by the stream. It appears that the river must have been stopped by the hardness of the rocks at this place, whereby it had to shift its fall to several points, till finding out the weakest, it continued its course by it.

The wear, of the great fall, is computed to be about one rod in three years. Assuming this as a standard, the great fall must have been about fifty rods lower down the stream when visited by Father Hennepin in 1681.

CHAPTER IX.

SPRINGS.

Mineral Springs at Saratoga, &c.

1. *Congress Spring.* This celebrated fountain is situated on the westerly border of a swamp. The water originally rose in the bottom of a small brook, which is now diverted. It discharges less than a gallon in a minute.

The gas escapes through the water as it rises, in fine bubbles, giving to the surface the appearance of simmering. When first dipped it is limpid.

The water, to most persons, is not unpleasant to the taste. Its most obvious effect, when taken as a medicine, is that of a cathartic and diaretic. In most habits, this effect is produced by drinking five or six half pints in the morning before breakfast.

The temperature of the water is about 50 degrees of Fahrenheite.

On analysis, one gallon, or 231 cubic inches of the water, was found to contain

Muriate of Soda	471.5 Grains
Carbonate of Lime . . .	178.474
Carbonate of Soda	16.5
Carbonate of Magnesia . .	3.356
Carbonate of Iron	6.168
Total	676.000 grains

The carbonic acid gas, contained in the same quantity, amounted to 343 cubic inches.

2. *Columbian Spring.* This spring issues out of the earth, at the foot of a steep bank, consisting principally of sand and loam,

about fifteen rods westerly from the Congress spring. The quantity of water is so considerable, that it is difficult to empty the spring with a bucket.

The gas breaks up through the water in large bubbles, at irregular intervals, giving to the surface the appearance of a violent ebullition. The surface of the earth over which the water escapes, is covered with the carbonate of iron and lime.

The water is quite limpid. Its temperature is the same as that of the Congress.

One gallon, on analysis, yielded

Muriate of Soda	201.5 grains
Carbonate of Soda	22.5
Carbonate of Lime	121.0
Carbonate of Magnesia . . .	1.5
Carbonate of Iron	7.5
Total	354.0 grains.

Carbonic acid gas 236 inches.

This water seldom operates as a cathartic, unless taken in large quantities.

3. *Washington Spring.* This spring is situated by the side of a little rill of very pure water, about fifty rods to the southwest of the Columbian spring. The earth around it is incrusted with calcareous and ferruginous substances. The water is sparkling, acidulous and very limpid. Its temperature is 48 degrees of Fahrenheite.

One gallon affords Muriate of Soda	231.5 Grains
Carbonate of Soda	16.5
Carbonate of Lime	127.5
Carbonate of Magnesia . .	2.5
Carbonate of Iron	6.0
Total	384.0 grains

Carbonic acid gas 247 cubic inches.

The water of this spring, when applied externally, is found to be very efficacious in ulcers and eruptions of the skin.

4. *Hamilton Spring* is situated in the marsh which forms the border of the brook, about fifty rods in a northeasterly direction from the Congress spring. The water issues through a loose black earth. The external appearance around it is similar to that around those already spoken of. Its temperature is 48 degrees. It emits large quantities of gas.

One gallon, on analysis, yields

Muriate of Soda	269. 5 Grains
Carbonate of Soda	24.5
Carbonate of Lime . . .	147.5
Carbonate of Magnesia . . .	7.5
Carbonate of Iron . . .	3.0
Total	452.0 grains.

Carbonic acid gas 284 cubic inches.

The water of this spring ranks among the first as a diuretic, &c.

5. *Flat Rock Spring.* Following the course of the brook, about one hundred rods from the Hamilton spring, we come to this spring. It is situated on the verge of a marsh at the foot of an eminence, which bounds the west side of the little valley, through which the brook passes. The eminence is mostly composed of an impure limestone covered with clay and sand, and is about forty feet high. The ground around the spring is incrusted with calcareous tufa, which forms a commodious platform. Near the center the water issues in a small stream. It resembles the Columbian. Its temperature is 48 degrees.

One gallon affords

Muriate of Soda	194.8 Grains
Carbonate of Soda	11.2
Carbonate of Lime	107.0
Carbonate of Magnesia	1.5
Carbonate of Iron	7.5
Total	342.0 grains

Carbonic acid gas 252.5 cubic inches.

The water is used in all cases in which the Columbian is.

6. *The High Rock Spring* is in the same valley, about one hundred rods in a northerly direction from the Flat Rock Spring, near the foot of a ledge of calcareous rocks, which constitutes the westerly side of the valley at this place.

This spring is surrounded by a conical rock, composed mostly of calcareous tufa. The rock is about nine feet in diameter, at its base, and between three and four feet in height. Very near its summit there is an orifice or opening, about ten inches in diameter, which gradually widens as it descends, leaving the rock, of nearly an equal thickness throughout. The water formerly flowed out at the orifice, but at present it does not rise nearer than about two feet. The water within the cavity is in a constant state of ebullition in consequence of the disengagement of carbonic gas. The rock which covers this spring has been made in time by the depositions of the water. Its temperature is 48 degrees.

One gallon affords

Muriate of Soda	210.0 grains
Carbonate of Soda	18.0
Carbonate of Lime	115.0
Carbonate of Magnesia . . .	0.5
Carbonate of Iron	4.5
Total	348.0 grains.

Carbonic acid gas 243 cubic inches.

7. *President Spring* is about thirty rods from the High Rock Spring in the same valley. The water breaks up through the fissures of a ledge of limestone. It is sparkling, and at the temperature of 51 degrees. The water is serviceable in urinary affections, and in diseases of the skin. Its constituents are similar to some of the preceding.

8. *Red Spring*, so called from the carbonated iron observed about it, is situated on the border of a marsh near the road, in a northerly direction from the President's Spring. Its temperature is 48 degrees. The water of this spring, like the others, contains the carbonates, and muriates and carbonic gas, but in different proportions. It is beneficial in ulcers and diseases of the skin.

Taylor's Springs are in the same valley, about one mile in an easterly direction from the High Rock Spring, and are three in number. The soil, through which the water runs, is argillaceous and sandy, combined with the usual deposites, iron and lime. The water of these springs is clear and brilliant, and of the temperature of forty-eight degrees. The properties are similar to some of the preceding.

Ellis' Spring is about two miles southeasterly of the Congress. It is on the declivity of the valley through which the northern branch of Kayaderosseras creek runs. Lamellated slate forms the bed of the stream. The water is clear and of the temperature of forty-seven degrees. In its descent it deposites iron and other matters.

The Ballston Springs.

These are two in number, and are situated in a small valley, seven miles southwesterly from those at Saratoga. A small stream runs through the valley, and enters the Kayaderosseras a little below the lower spring.

The first is near the centre of the village, and is sometimes called the Upper Spring. The water rises in a basin—it is clear and sparkling, and in a constant state of ebullition, occasioned by the escape of carbonic gas. Its temperature is fifty degrees of Fahrenheite. One gallon of the water, on analysis, yielded

Muriate of Soda	159 grains.
Carbonate of Soda . . .	9
Carbonate of Lime . . .	75.5
Carbonate of Magnesia . .	2.5
Carbonate of Iron . . .	7.0
Total	253.0 grains.

Carbonic acid gas 210 cubic inches.

Low's Spring is about eighty rods further down the creek. Its temperature is fifty-two degrees. The water, in every other respect, is like that of the upper spring. The water of this

spring formerly rose in the bottom of the creek which flows through the valley.

One gallon of the water holds in solution

Muriate of Soda	142	grains
Carbonate of Soda	10	
Carbonate of Lime	64.5	
Carbonate of Magnesia	1.5	
Carbonate of Iron	6	
Total	224.0	grains.

Carbonic acid gas 220 cubic inches.

The *New Spring* is situated in the same valley, a few rods above the upper. This was formed by boring 237 feet into magnesian limestone. The rock abounds with veins of iron pyrites. The quantity of water discharged in a minute, is seven pints. In colour and properties, it is like the preceding. The water rises in a tube 237 feet.

The Mineral Springs of Saratoga and Ballston, are situated within the Sandy tract already noticed, as extending from the mountains on the north, to Kinderhook on the south, and on and near the borders of the transition, and secondary formations in this section of the State. All these springs, as far as they have been examined, appear, with very few exceptions, to possess the same qualities, differing only in the quantity of the substances common to all. From these facts, it has been justly concluded, that they derive their essential properties from one store, and that the differences between them are occasioned by the different earths and matters over which they pass before they emerge.

The number is not limited to such as we have noticed.

The waters are salutiferous in billious, despeptic, calculous and nephritic complaints; ulcers, cutaneous eruptions, gout, chronick, rheumatism, scrofula, dropsy, where the case is recent, paralysis, costiveness, &c. &c.

The Agoneaseah were acquainted with some of the medicinal virtues of the High Rocky Spring, particularly in rheumatic complaints, &c.

See Dr. Steel's Analysis—Dr. Seaman's Dissertation on the mineral waters of Saratoga—Observations of Messrs. Van Dervoort and Griscom—Mead's Analysis—Experiments of Dean, published at Boston, in the N. E. Journal—A letter of Dr. David Hosack, dated June 1810. *and published in the American and Medical Philosophical Register*, &c. &c.

Mineral Spring at New Lebanon.

This renowned spring is situated twenty-five miles east southeasterly from the city of Albany, on the declivity of the mountain which bounds the valley of Taconic on the east. The spring is nine or ten feet in diameter, and three or four deep. The quantity of water discharged is sufficient for mills. It is transparent, and of the temperature of seventy-two degrees of Farenheite. Its temperature being so near that of summer heat, renders it a delectable bath.

In winter, spring and autumn, when the temperature of the water surpasses that of the atmosphere, a small cloud of vapor is to be seen constantly hanging over the fountain. This cloud is much denser in very cold weather than at other times.

The water in the spring is in a never ceasing state of ebullition, and discharges large quantities of gas. It is tasteless, inodorous and soft, and deemed beneficial in internal obstructions, salt rheums, and various other cutaneous affections.

Considerable numbers of persons repair to this spring, either for the benefit of their health, or amusement.

The situation is healthy, and the surrounding country beautiful and picturesque.

Sulphur Springs.

There is a spring in the town of Richfield, in the county of Otsego, seventy miles west of the city of Albany, and fifteen southeast of the town of Utica, whose waters are efficacious in scrofulas, eruptions, ulcers, and some other complaints. The water issues out of the ground on a gentle eminence, and in its

way deposites a whitish sediment. It emits a strong smell, not unlike rotton eggs or bilge water, which may be perceived some rods. After being drank, it occasions a fullness at the stomach, accompanied with gentle eructations. It operates as a mild purgative, exciting a moderate appetite.

This spring may be classed with the sulphuretted hydrogen springs, so common in the vicinity of the Hudson, and in some other parts of the State, with this difference, that its waters are stronger.

Sulphur springs, or waters, charged with sulphuretted hydrogen, issuing from glazed slate, are very abundant on both banks of the Hudson, from Fort Miller to the Highlands, or Matteawan mountains, a distance of about one hundred and thirty miles. The same kind of springs also occur in the Mohawk country, where the common people call them Gun-powder Springs.

The springs at Green Bush, in the county of Rensellaer, are much more highly charged than any other within these limits. One of these springs is opposite to Albany, and the other about three miles south. There is also a similar one near the city of Troy.

In the town of Frankfort, in the county of Herkimer, about five miles east of Utica, there is one of these springs. It is by the road side, at the foot of the canal embankment. The water issues out plentifully, and imparts so much gas, that it may be perceived some rods. It deposites a whitish sediment.

Sulphur Spring in the town of Saratoga.

This spring is situated between two and three miles from Ellis' Spring, directly up the creek. The water rises perpendicularly from the earth, at the foot of a hill, in a stream sufficient to turn a mill. It is clear, and very strong, and may be perceived by its sulphurous odour several rods. Its taste is unpleasant, slightly resembling bilge water. It deposites a brown sediment, which marks its passage to the creek, a distance of

about one hundred yards. The temperature of the water is fifty degrees of Fahrenheite.

The sediment which the water deposites, is composed of iron and lime, combined with a small quantity of white sand.

The hill, from beneath which this spring issues, is composed of sand and clay, intermixed with a great variety of small stones.

Although this spring is called a sulphur spring, yet it is supposed that its waters contain none of that mineral.

The water contains muriate of soda, carbonate of lime, and carbonate of iron: besides these it contains some carbonic acid gas, and sulphuretted hydrogen.

See Dr. J. Steel's Analysis of the Saratoga and Ballston waters.

There is a sulphur spring at Ballston Spa, situated within seven yards of the lower spring, or Low's Spring. Its temperature is fifty-two degrees. The waters are efficacious in cutaneous diseases.

The following substances have, on analysis, been detected in one gallon of its waters:—

Muriate of Soda . . .	64 grains.
Carbonate of Soda . . .	6
Carbonate of Lime . . .	30
Carbonate of Iron . . .	4
Total	104 grains.

Carbonic acid gas 144 cubic inches.

Sulphuretted hydrogen 7 cubic inches.

There is a suphuretted hydrogen spring in the town of Stillwater, in the county of Saratoga, about one mile south of Snake Hill.

In the town of Pharsalia, in the county of Chenango, is a sulphuretted hydrogen spring, which is considerably used in eruptive humours of the skin, &c.

About one mile south of Manlius Square, in the town of Manlius, Onondaga county, there is a sulphur spring. The water issues out from beneath calcareous rocks.

Near Lay's Falls, in the town of Massena, and county of St. Lawrence, there is one of these sulphur springs, which is said to be beneficial in cutaneous affections. The water comes from beneath shistic rocks.

The Nitrogen Springs, at the town of Hosack, in the county of Rensellaer, six miles southwest of Bennington, in Vermont, are very interesting. They are three in number, and are situated in a small field. The quantity of pure nitrogen gas which issues in the form of bubbles, is immense. It does not appear to be combined with the water, but to issue from the gravel beds beneath the water. The same kind of gas is also supposed to issue from the dry soil in their vicinity.

These springs are highly charged with muriate of lime.

See A. Eaton's Geo. Survey of Rensellaer county.

Burning Springs.

These springs are found in considerable numbers, in the secondary formation. We shall commence with that at the Osquake, in the town of Stark, in the county of Herkimer.

This spring is situated in the upper part of the valley of the Osquake creek, about half a mile above the mills of the Messrs. Richard and Daniel Van Horne. It is on the north side of the creek, about midway between the creek and hill. The water rises from beneath the fissures of some rocks. It is tolerably clear when put into a tumbler, and not unpleasant to the taste. The smell which it emits is very much like that of putrid fish. This smell is much more obvious on immersing the hands in the water. The water stains leaves and wood a dirty black colour.

The water, as it issues out, disengages inflammable gas in such profusion, as to produce combustion, on holding a lighted candle near its surface.

The combustion is the most sudden, and of the greatest duration, after long drouths, when the spring is very low. On such occasions it has been known to burn for hours, nay, days, with a single firing. The combustion is very much like that of

spirits. The flame is unsteady, and not dense, which is occasioned by the nature of the combustible matter. The water does not burn, nor does it become heated. Nothing burns but the inflammable gas, and this does not before it is disengaged and comes in contact with the atmospheric.

The combustion is greatly accelerated by covering the surface with an inverted tunnel, which forces the hydrogen gas to ascend through the orifice, where it is discharged in a small stream. The tunnel must be surrounded with earth, in order to confine the gas, and compel it to ascend through the orifice, otherwise but little will rise.

The rock formations appear to be blackish grey wacke slate, sandstone, red oxide of iron, calcareous sandstone and secondary limestone. The wacke is the lowest, and the limestone uppermost. The three first are to be seen in and near the creek, in the neighbourhood of the mills.

There are several burning springs in the county of Ontario.

That in the town of Bristol, about eight miles southeasterly of the village of Canandaigua, is in a ravine at the base of a small eminence. The water is pure, and emits so much inflammable gas, that it ignites on the application of a lighted candle. The flame is unsteady. Combustion is more easily communicated, and is more active, and of longer continuance in drouths, than when the spring is raised. The stone, in the vicinity, is shale. A small brook flows through the ravine.

The springs in Middlesex, in the county of Ontario, are situated from one to two miles southwesterly from the hamlet of Rushville, along a tract nearly a mile in length, partly in the bottom of a little valley called Federal Hollow, and partly at an elevation of forty feet on the south side of the Hollow.

The springs in the town of Canandaigua, are situated on both sides of the lake of the same name, and within three miles of the village.

These springs, as well as those at Middlesex, emit much hydrogen gas, which, when lighted with a candle, burns with a beautiful flame.

There are four or five springs southeasterly from that at Bristol, in the same county.

There is also one in East Bloomfield, near a bed of gypsum, and another at the town of Richmond.

In the town of Wales, in the county of Erie, there is also an inflammable spring. It is near the eastern boundary of the county, not far from one of the branches of Buffalo creek.

One of the same kind of springs is in the county of Chatauque, in the town of Portland, on the borders of Lake Erie.

In Westmoreland, Oneida county, eleven miles west of Utica, there is another of these springs. There is likewise one near the village of Vernon, in the same county.

There is reason to believe that coal is entombed in the earth in the vicinity of all these springs. Wigan's Well, in England, emits inflammable air, and burns on applying a lighted candle near the surface. Coal is known to abound in its vicinity. Inflammable springs are frequently found near beds of coal in England and France.

Sulphur Springs.

In the town of Phelps, in the county of Ontario, about eleven miles northwest of Geneva, are situated the famous springs of Clifton.

They are on the side of a hill composed of limestone. The principal springs are three in number, and collectively discharge a very considerable quantity of water.

The water, when it emerges, is clear, but soon becomes dark, and of a yellowish hue. This hue appears as the water descends the declivity, and becomes more apparent as it traverses the valley at the foot of the hill. The yellow hue is occasioned by the calcareous and sulphurous matters which the water holds in suspension and solution. This is proved by the depositesalong the rocky bottom over which it flows ; and by the vapor which it yields, sticks, leaves, plants, and even the loose stone lying in the bed of the stream are, in many instances, incrusted with the sulphurous and calcareous matters.

The vapor which is emitted at the issues, and for some distance, rises to a considerable height, and spreads on all sides, so that it can be smelt for many rods. The odour is that of hydrogen gas, holding sulphur in solution.

The water, notwithstanding the sulphurous and calcareous matters which it holds in solution and suspension, is friendly to animal and vegetable life—men drink the water—plants grow and thrive on its borders, and even within the stream. In the case of men it produces a little nausea, which seems to arise rather from the sulphur smell than from any thing else.

Besides the deposites already mentioned, there are likewise considerable depositions of calcareous carbonate, in places where the stream is gentle.

Both the calcareous and sulphurous matters appear to be in a state of solution, as well as of suspension. In the former case, this is manifested by the vapor emitted, and in the latter by the deposites found along, and in the bed of the stream.

Some suppose that the sulphur deposited and emitted in the form of gas, originates from the decomposition of animal relicks, entombed in the limestone rocks.

Within a-quarter of a mile there are other springs of the same kind. These are situated on the side of a hill, but the quantity of water discharged is very inconsiderable, so much so, that it is unable to carry off the calcareous and sulphurous matters: hence they are left on the spot, where they have formed beds, or more properly speaking, sloughs, which cover an extent of eleven or twelve rods in diameter. In these sloughs we find, in addition to the calcareous and sulphurous matters, mud, sticks, leaves, and other materials that chance may have thrown into them.

The matters thus accumulated in time might be taken up and carried away in loads.

The rock stratum, where the waters issue out, is filled with the remains of testaceous animals, and marine exuviae, many of which cannot be referred to any of the now known or living species.

It is supposed that the inflammable air and sulphur with which these waters are charged, are produced by the decomposition of animal matter, enveloped in the limestone rocks from whence they issue. For more particulars relative to this interresting subject, we must refer the reader to the *Medical Repository*, vol. 12, pages 69, 70, (*Munroe.*)

The sulphur spring, northwest of Geneva, in Ontario county, is large enough for a mill. The water rises out of the ground in two places—adjoining thereto are two large bogs composed of sulphur and other matters left by the waters—these bogs are so very spongy, that a stick may be thrust into them six or seven feet. The sulphurous odour emitted is so strong and copious, that it may be smelled a mile at times.

In the north part of the county of Brutus, in Cayuga county, there is a spring possessing some mineral virtues. It is situated in a swamp, three-quarters of a mile south of Seneca river, a-quarter of a mile northeast of Weed's Basin, and about forty rods north of the Erie canal, on the lands of a Mr. Raynor. That part of the swamp, in the vicinity of the spring, is wet and miry, and covered with black ash, and other timber, peculiar to such situations.

The water rises near the centre of a small swell, whose altitude is about five feet, and flows off in considerable quantity. The swell slopes off on all sides, and may be fifteen rods in circuit. It has been made, as is manifest from the alluvial rocks found in it, by the depositions of the water. These rocks have somewhat the appearance of iron rust. The water stains wood, and other things over which it flows, a rusty colour. The water contains carbonate of lime, iron, &c.

Oil Springs.

Mineral Oil—Under this head or term, are comprehended two substances, Naphtha and Petroleum, both of which are liquid, highly inflammable, and lighter than water.

The most copious springs of Naphtha known, are on the coast of the Caspian Sea, in the peninsula of Apcheron. The surrounding country is calcareous, and the soil which affords the Naphtha, is sandy and marly. Naphtha, used for medicine, is prepared by distillation.

Petroleum is found in many countries, principally in those producing coal. It is rather thicker than common tar, has a strong disagreeable odour, and is of a blackish or reddish brown colour. It is found in the greatest abundance in the Birman, Turkish, and Persian Empires, in Asia. See *Philips' Geology, Edinburgh Encyclopædia*, &c.

Petroleum occurs in the States of New-York and Ohio, and various other parts of the two Americas.

In this State and Ohio the springs are improperly called oil springs.

In the western part of this State, and particularly in the county of Cattaraugus, there is one of these springs affording Petroleum, which is sold under the denomination of Seneca oil. It is found floating on the surface of the water, from whence it is collected. It is employed internally and externally, and is found very efficacious in certain diseases, more especially of the stomach, intestines, kidneys, skin, joints, &c.

Springs of Petroleum are also found a few miles southeasterly from the mouth of Eighteen Mile creek, of Lake Erie. They are in the southern part of Erie county. They are situated in the bituminous slate rock which supports the soil of this tract of country. The bituminous slate along the shore of the lake, a few miles northwest and west of these springs, burns when ignited.

The oil collected from that at Cattaraugus, is very pure, and used without distillation, or any previous preparation.

This spring is on the north fork of Olean creek, eleven or twelve miles north of Hamilton, on the Alleghany river.

It is not improbable there are deposites of coal in its vicinity. The Petroleum springs of England, Scotland, France, Italy, Germany, &c. are all, we believe, without exception, either within or neighbouring to the coal formations. An examination of

the rock formation, bordering this spring, might perhaps lead to the discovery of this highly important mineral which has hitherto been sought for in vain in this State.

The existence of bitumen, in the secondary slate, at the outlets of Canesus and Honeyoe lakes, and at the fork of Genesee river, although not positive, is yet presumptive evidence of coal deposites.

Clove spring, in the vale of Clove, in the town of Beekman, and county of Dutchess, is about forty yards in circumference, and affords water enough for a grist-mill. Clove-kill, a branch of Fishkill, issues from it. This spring is remarkable for nothing but its size, and the volume of water which it discharges.

The vale of Clove is six miles long, and from one to two broad, and bounded by mountains.

Big spring, in the town of Caledonia, in the county of Livingston, discharges water enough, in the driest seasons, for mills. The water rises from beneath the fissures of calcareous rocks. This spring derived its name from the large quantity of water which it emits.

Deep spring, situated in Manlius, county of Onondaga, a little west of Chitteningo creek, is so called from the depth of its water. The water which it discharges is copious—limestone underlays the country hereabouts.

Cold spring is remarkable on account of the coldness and volume of its water. It is situated in the town of Concord, in the southeastern part of Erie county.

Canoga spring, in the town of Fayette, and county of Seneca, emits water sufficient for mills. Canoga creek, a beautiful rivulet, has its origin in this spring. Mills have been erected a little below the spring. The rocks around this spring are limestone. Canoga falls into Seneca outlet, after a short course.

Salt Springs, or Brine Springs.

Salt or Brine Springs are of frequent occurrence in the western part of the State. They seem to occupy a narrow strip of country, extending from Vernon, in the county of Oneida, west-

wardly to Niagara river, a distance of rather more than one hundred and eighty miles. The Erie canal runs a great way either through this strip or a little south of it. The gypsum beds, between Oneida creek and the Montezuma marshes, are situated on or near the south side of it—so are those along the outlets of Seneca and Canandaigua lakes; and likewise those found west of Genesee river. The strip is wholly within the secondary formation. All the springs hitherto discovered, are north of the great limestone formation, stretching from Coeymans, in the county of Albany, westerly into Upper Canada, and north, or among the gypseous beds, some few instances excepted. The limestone, with very few exceptions, exhibits a much more elevated surface than the gypsum. Red sandstone, belonging to the class of secondary rocks, underlays the strip of country containing the springs.

The following appears to be the disposition of the rock formations.—First, red sandstone underlaying in general the whole strip:—Second, grey band, resting very often on the latter:—Third, ferruginous slate:—Fourth, ferruginous sandstone:—Fifth, limestone lying usually south of the strip, but on the preceding rocks. The gypsum, and water limestone, and some other rocks, are in beds and patches, lying upon the limestone or some of the others. It is doubtful whether any of the rock formations enumerated, extends uninterruptedly through, except the sandstone and limestone.

The deposites of rock, or fossil salt, are above the red sandstone and below the limestone. This seems to be demonstrated from the fact, that no brine springs have been found below the former or above the latter. Hence, we conclude that they are in the gypseous, and other beds, of more recent formation.

The springs which have already been found within this narrow strip, are situated in the counties of Oneida, Madison, Onondaga, Cayuga, Seneca, Wayne, Munroe, Orleans and Niagara. We shall commence with those at the eastern end.

The first is in the town of Vernon, in the county of Oneida. It is on the west side of Skanando creek, a tributary of Oneida

creek, six or seven miles south of the Erie canal. The water issues from the upper surface of the red sandstone. The rock is soft and slaty, and very brittle. The water is too weak for the manufacture of salt. The country is either flat or very moderately rolling. There is no gypsum or limestone in its vicinity, at least none has yet been discovered. The limestone formation passes some miles south. The soil around is mostly clay, sometimes yellow, sometimes red, and at others blue. Beds of marl are found in the adjoining swamps.

In Madison there are several. That at Lenox is situated on the same red sandstone rock, and a little north of the gypsum beds. The lands on the south rise into hills, and on the north descend into levels. The water of this spring, as well as the others, although more highly impregnated with saline matters, has not sufficient strength to make it an object of manufacture. The soil is chiefly clay, often tinctured with a reddish hue. Shale occurs in the vicinity of these springs, also indurated clay, marl, &c. The opening made for the Erie canal has laid these bare to human inspection.

The celebrated Saline Springs of Onondaga, are in the county of the same name. They are mostly in a marsh, extending around the head of Onondaga lake, somewhat in the form of a crescent.

The marsh is nearly two miles long, and half a mile broad at the village of Salina.

The point, a plain on which the village is built, rises from near the centre of the marsh, and extends southeastwardly and southwardly. This plain is limited, on one side, by the cedar swamp, lying along Onondaga creek, and on the other side by a marsh and swamp, lying along a small stream running into the lake. Both expand into the marsh. To the southeast this plain rises imperceptibly into the hilly country. The soil is mostly clay. The marsh and swamps exhibit great diversities of soils, such as vegetable earths, imperfectly decomposed, marls, clays, loams, sand and gravel. These are found now separated and then huddled together without order. They were obviously, if we except some of the vegetable earths, and

some of the marls brought from the upper country, by Onondaga creek, &c. and deposited, while the waters of the lake covered the marsh and swamps.

The red sandstone rock, before mentioned, underlays the marsh, swamps, plain and lake. It forms a brim around the latter. The shoal waters and marls bordering them, cover the top of this brim, while the deep waters are within. The declivity of the brim drops almost perpendicularly sixty or seventy feet, which is a little under the usual depth of the lake.

The limestone formation passes to the south, and at the distance of five or six miles has an elevation of more than four hundred feet above the surface of the marsh and lake.

The principal spring, and the one from which most of the water used in the manufacture of salt is obtained, is situated near a small brook, towards the exterior of the marsh, hard by the point of the plain containing the village of Salina. It is about twenty-two feet deep, and ten feet in diameter. The depth and circumference are mostly artificial, having been enlarged in order to obtain more water.

The water is so highly charged with salt, that fifty-six pounds are made from eighty gallons.

Nearly all the salt heretofore fabricated at Salina, Liverpool, Geddesburgh and Syracuse, was made from waters drawn from this spring. In 1824 the quantity amounted to 800,000 bushels, or 44,800,000 pounds.

This is the spring which was known to the Agoneaseah. Its waters, when our people first settled at Salina, emerged from beneath the soil, and flowed along the surface to the brook just by. The enlarging and deepening of the spring have brought to view much more water than was originally discharged at the surface.

Salt water is obtained in various parts of the marsh, by digging wells. The depth at which it is obtained vary considerably. Perhaps it would not be a departure from the truth, to say that it may be obtained from a few feet below the surface, to the sandstone underlaying the marsh. In some instances it may be had by descending into that rock. The usual depth

of the wells is between fifteen and thirty feet. There is no salt water under the red sandstone, as appears from borings heretofore made by Mr. Byington.

Hitherto the quantity of water obtained by digging wells has not been considerable, and has by no means answered public expectation. Independant of the quantity, a difficulty has occurred which no human foresight has as yet been able to guard against, that is, an absolute failure of water by diversion. In some instances, wells which appeared of great promise, have failed almost as soon as dug, and in others, after a lapse of some months or years. The cause of this is the derangment of the earths composing the marsh, and the little adhesion which many of them possess.

Before government took the waters under its care, and before large quantities of salt were manufactured, the several manufacturers had respectively wells from whence they took water to answer their purposes. Some times two or more would join, and have one in common: however, as the demand for salt increased, and as these works were extended, it was found that the water furnished by these wells, was altogether inadequate—recourse was then had to the large well.

At Liverpool, about three miles nearly north from Salina, salt water has been procured by sinking wells. It is not so highly charged with salt as that obtained in the Great Well at Salina. Till recently the inhabitants have been mostly supplied with water for the manufacture of salt from Salina.

The country on the east as well as west side of Onondaga lake, is quite low and level. Flats and swamps cover the west side throughout its whole extent. They contain many thousand acres. The swamps contract near and at the outlet, and end in the swamp lying along Seneca river.

A well has lately been dug at Geddesburgh, about a mile from Salina, which promises to be of great utility. The water is strong, and in considerable abundance. Considerable water has recently been found at Liverpool by boring.

The Salt springs in Cayuga county, are at Montezuma, on the eastern borders of the marshes. These marshes stretch from

the foot of Cayuga lake, northwardly along Seneca and Cayuga outlets, and Seneca river, twelve or fourteen miles, with a breadth of three or more miles. They are wet, and are generally inundated once every year. Whenever this happens they and Cayuga lake form but a single sheet of water.

The lands lying east of the marshes, and north of the canal, as far as Seneca river, embracing both sides of that river, are low, flat, and swampy, and like the marshes, have every appearance of having been made before the desiccation of the lake, which once covered the vale of Seneca and Oneida.

Beds of gypsum are but a little way south of the springs. The limestone lies beyond the latter. A continuation of the same red sandstone rock, which forms the floor of the marsh at Salina, forms the floor of these marshes, and the swamps that nearly encircle them.

The water is obtained from wells. These wells are from eighty to one hundred and thirty feet deep. The red sandstone rock lies deeper here than eastwardly. The water of these wells contains less salt than that obtained from the wells at Salina. It is also far less abundant. Although these springs rank next to those at Salina, yet from their being less rich, and from their affording less water, combined with some other circumstances, they are at present considered of little importance.

It is however probable that after the marshes and swamps are drained, and the country well cultivated and peopled, that these springs will be brought into repute.

Those at Galen, in Wayne county, a few miles northwest of those at Montezuma, and those at Clyde, in Seneca county, a few miles west, are situated in low swampy and marshy ground above the same sandstone rock.

Their waters, although not so strong as those of Montezuma, are of sufficient strength to lead to the making of salt at these places.

There are several brine springs in Clarkson, in the county of Monroe, about eighteen miles west northwest of Rochester.

In Murray, a little further west, there are likewise some salt springs. The same red sandstone rock underlays this part of

the country. The water hitherto found at these springs is not so plentiful nor so strong as that at Salina.

The difference in elevation between these springs and those at Salina is not great.

In the western part of the county of Orleans, in the ravine of Oak Orchard creek, salt water has been found. The locality is between the Erie canal and the ridge road, or ancient beach of Lake Ontario. The same red sandstone rock found at Vernon, Lenox, Salina, Montezuma and Clyde, is found here. The water is not so strong as at Salina. Salt is made here in sufficient quantities for the consumption of the inhabitants in the vicinity.

The waters obtained are by no means copious.

It is said that a Mr. Bennet, some years ago, bored one hundred and forty feet into the sandstone rock.

Like the preceding, the limestone formation lies south of these fountains.

Saline springs occur on Eighteen Mile creek, in the county of Niagara, near the foot of the northern steep, erroneously called the mountain ridge. They are northwest of Lock Port, and south of the ridge road. In point of locality, they do not differ materially from the preceding. As yet very little is known about them.

Remarks—1. Salt or brine springs are never found in primitive countries, but generally in the newer secondary formations.

2. They are sometimes found surrounded by a brownish red sandstone.

3. They are found in countries in which no depositions of rock-salt have been discovered.

4. The brine usually contains sulphate of soda, sulphate of lime, &c.

5. Sulphate of gypsum, or sulphate of lime almost always accompany rock-salt, and is sometimes so impregnated by it as to be worked as a salt mine.

6. Red or grayish clay frequently alternate in beds with rock-salt.

7. Rock-salt commonly rests upon sulphate of lime, and is covered by carbonate of lime.

8. Rock-salt is usually disposed in thick beds, either superficial, as in Missouri and Arkansaw, in the United States, and Africa, or at a very great depth, as in Poland. In the steppes of Missouri, Arkansaw and Red River, it seems in some instances to form plains of some extent.

The strength and quality of the brine always increases after long and continued rains, and the melting of the snow, an evidence that the waters supplying these springs traverse beds of fossil salt, and dissolve and take up portions.

Borings ought to be made at a distance from the springs, and towards, or at their sources. The heads of these springs are higher than their issues. The water flows down inclined plains.

" The principal salt springs, and the rock-salt at Cheshire, in England, are near or on the red sandstone rock, in the vicinity of a range of lofty hills, which extend from the high peak in Derbyshire, to Browngrove Lickey, in Worcestershire. Near Northwich, in Cheshire, the upper bed of rock-salt lies forty-two yards below the surface, and is twenty-six yards thick; it is separated from the lower bed by a stratum of argillaceous stone, ten yards thick; the lower bed has been penetrated to the depth of forty yards; its breadth is fourteen hundred yards, and in one direction it has been known to extend a mile and a-half. Three other beds of rock-salt have been found in another part of the same county; the uppermost four feet thick, the second twelve feet thick, the third has been sunk into twenty-five yards. In Cheshire, the red sandstone contains immense beds of common salt. Brine springs have been met at Droitwich, in Worcestershire, in the midst of a similar red sandstone. The strata here are as follows :—from the surface mould five feet—marl thirty-five feet—gypsum forty feet—then a river of brine, twenty-two inches—afterwards gypsum again, and below this a rock of salt, into which the workmen have bored five feet."—*See Edinburgh Ency. American ed. No.* 16, *let. E. p.* 541, *article, Mineral Geog. and Geol.* &c.

The red sandstone, in which the brine springs at Droitwich are situated, rests on grey wacke, &c.

The red sandstone, in which our salt springs are situated, rests on the same kind of rock.

Gypsum is found in beds in the vicinity of most or all the springs.

Marl is often found immediately around them, and never very distant.

Limestone occurs near our springs, but it is almost always more elevated than the gypsum.

There seems to be a remarkable coincidence in most particulars so far as we are acquainted.

Cheshire Salt Beds, &c.

Remarks.—1. The upper bed of rock-salt lies forty-two yards below the surface	126 feet.
2. The bed of salt is twenty-six yards thick .	78
3. The argillaceous stone, on which the salt bed lies, is ten yards thick	30
	234
4. The second bed lies below the last, and is two hundred and thirty-four feet below the surface. The lower bed has been penetrated to the depth of forty yards	120
Entire depth	354 feet.

Worcestershire Salt Beds, &c.

1. Mould	5 feet.
2. Marl	35
3. Gypsum	40
4. The Salt bed at the depth of . . .	80 feet.

In the first it will be seen that the upper salt bed is one hundred and twenty-six feet below the surface, and the lowermost two hundred and thirty-four feet.

In the second it will be seen that the salt bed lies eighty feet below the surface.

The quantity of salt made in Cheshire, in a year, is 156,000 tons, or 5,571,428 bushels, of fifty-six pounds each, nearly seven times as much as is made in Onondaga.

The brine springs were, it is supposed, known to the Britons. It is certain that they were worked before the Norman conquest; but the pits of rock-salt were not discovered in Cheshire prior to the year 1670.

The salt mines of Cheshire, of Austria and Poland, are mostly situated in or near gypsum beds, and in that kind called by geologists, first secondary. This is considered the oldest kind of gypsum among the class of secondary rocks. The gypsum, in those countries, contains, besides the beds of salt, beds of clay, of marl, of sulphur, of sandstone and limestone, all of which are denominated subordinate beds.

The gypsum of Madison, Onondaga, Cayuga, Wayne, Seneca Genesee, &c. is first secondary.

At Cheshire, in England, the salt springs were first discovered and worked. These led to the discovery of the salt mines. Recourse was had to boring, however, before these discoveries were made. There the salt mines are neighbouring on the salt springs. Here the same order of things exists. Nature is no wise different. She has deposited salt in beds in the vicinity of our salt springs. These beds yield some portions of the salt to the fresh waters which flow over them, in the same manner as those do in England. They cannot be remote from the springs, because the rock formations will not admit of it. If we wish to find them, we must have recourse to boring. And this must not be done on the marshes, or very near where the springs and wells are because, there is no fossil salt in those places. No hope need ever be entertained of finding any thing but salt and fresh water. The simple fact of fresh water being found just by the salt water, and of wells affording fresh water at one time and salt at another, shows that there is no fossil salt, because if there was the water would be salt at all times.

The deposites of salt are south or southeast of the springs, and within or near the gypsum beds. Here searches ought to be made. The borings ought to be frequent, and in certain lines,

and to certain depths,* in order to reach the salt beds. The saturated waters are at first fresh, and afterwards salt, in consequence of their passing over beds of salt. The stronger the water the more extensive the salt bed, because the water, in passing a long line, dissolves, and takes up more salt than in passing a short line. So a large volume of water dissolves and takes up more than a small.

The sources of large springs, it is inferable, are more remote than those of small. The principal spring at Onondaga comes some distance, and it is not improbable but its waters may separate when they arrive or come near the marsh. By this we do not mean to say, that all the salt water about the lake comes from the same salt bed.

The salt bed or beds, from whence the waters at Salina derive their saltness, are, in our opinion, situated southeasterly, and perhaps south southeasterly of the village of Salina. The country, on those sides, rises very gently, and in a southeasterly direction, and attains an elevation of seventy or eighty feet at the distance of two miles, computing from near or at the great spring, or well, from whence the greater part of the water is obtained for the salt works. The country hereabouts is very level and continues rising in a southeasterly direction, till it ends in gentle swells. A cedar swamp crosses the canal at and about the west end of the long level. It extends on the one hand to the valley of Onondaga creek hard by, and on the other in the direction of Oneida river. To the south and southeast of this swamp, are beds of gypsum, marl, &c. The swamp also abounds with marl. The salt bed or beds are then not far from this swamp—possibly portions may be beneath it. From the swamp and gypsum beds, to the marsh at Salina, is an inclined plain, underlayed with red sandstone. The sandstone rock dips to the west, and slopes to the north. The slope, in this formation, every where, is towards Ontario, and is often made up by offsets. In the west, and in the vicinity of the lake, these offsets are much the best defined.

*Down into the red sandstone rock.

We have just remarked, that from the swamp and gypsum beds, to the marsh at Salina, is an inclined plain. The red sandstone forms the floor of this plain, and the salt water runs over it to the marsh, where it shows itself. The floor, it will be seen, leans to the marsh. Hence the water must follow the direction of the slope. Hence it reaches the marsh. The springs* on that part of the marsh, lying west of Onondaga creek and lake, derive their saline properties from another or other beds. The rises on each side of the upper part of the marsh, and the hills along the creek, seem to lead to this induction. Soon after passing on to the south side of the canal, they rise very considerably, particularly on the west side of the valley through which the creek runs. At the hollow, only five miles south of the canal, they are three or four hundred feet high, a mile from the valley, and this on both sides. They are composed of compact limestone, belonging to the class of secondary rocks. The general declivity of the formation, in Onondaga county, is northwardly. The salt springs then around the head of Onondaga lake, in our opinion, derive their saltness from two or more beds of salt, the one lying east of Onondaga creek, and the other west. The slopes towards the marshes, the configuration of the country, and above all, the valley through which the creek runs, and the swamp, after it has passed the canal, seem strongly to confirm it. Again, acorns and small chips have been found in the great spring, which must have been brought down from the Oak woods, beyond the plain and cedar swamp.

At Montezuma the salt water lies much deeper than at Salina, while at Lenox, in the county of Oneida, it lies nearer the surface. This is explicable in the following manner:—The red sandstone which seems to form the floor of all the salt springs, dips in a westerly direction till after it has passed beyond the Montezuma marshes, when it rises and afterwards descends, &c. In Madison and Oneida, it often comes to the surface; at

* It is said that by drawing the water from the large spring, the others in its vicinity, are lowered several feet. If such be the fact, it is to be infered that all these springs, in a given space, derive their supplies from one subterraneous stream which separates into several parts near the marsh.

Salina and Montezuma it does not show itself, being entirely covered by the newer formations. No salt or salt water has been found below this rock. Mr. Byington of Salina, bored through it, and came to a conglomerate, but he found no salt or salt water. He, however, found salt water above this rock, and within it. The conclusion then is, that the salt water is above the rock, and that this rock is the floor not only of the salt springs, but of the beds of salt, or those beds embracing the salt beds, such as marl, gypsum, &c.

For further particulars in relation to our salt springs, we beg leave to refer the reader to a work published some years ago, by Dr. Jeremiah Van Rensellaer, of the city of New-York, entitled "*An Essay on the Salt Springs*," which contains much valuable information. We should have made some extracts had we possessed the work in time, as they could not have failed to interest such readers as are fond of American literature.

The salt springs, in the neighbourhood of Oldesloe, in Denmark, have been known since the twelfth century. The water is raised by means of mills and pumps, into the buildings prepared to receive it, and the process is the same as takes place in other salt works of the same nature. The number of workmen employed is about forty, and the quantity of salt produced is 18,000 tons annually. *See Ed. Encyclopædia, article, Denmark.*

Observation.—18,000 tons are equal to 610,714 bushels, allowing fifty-six pounds to the bushel, a quantity nearly equal to what has ever been made in one year at Salina, &c. The process is by spontaneous evaporation. We have adduced this as an instance to show the great saving between this mode and boiling, in labour and fuel.

CHAPTER X.

CHANGES IN THE WEST CANADA CREEK, RIDGE ROAD, &c.

THE West Canada creek, about a mile and a-quarter above its junction with the Mohawk river, must, at a period not very remote, have abandoned its former bed, for an extent of fifteen hundred and fifty paces, and opened a new one in a more direct line towards the river.

The West Canada creek runs for sixteen or eighteen miles between high hills, before it enters the valley of the Mohawk. Four hundred and seven paces below the commencement of the ancient bed, there is a transverse ridge of hills which extend nearly across the valley—it at present is about six hundred and ten paces in length, and from fifty to one hundred and forty paces in breadth at its base. This ridge must once have extended quite across the valley of the creek, and connected the lateral hills, as is demonstrated by the ancient bed on the west, and the present bed, and the projection on the east. The projection is directly opposite to the transverse ridge, and appears to be composed of the same materials. The transverse ridge is now isolated, having the ancient bed at one end, and the present at the other. The creek is receding from this isolated ridge, and wearing down the projection, which comes to the water's edge, and ends in a kind of bluff.

It is obvious, on inspection, that the waters of the creek must have ruptured the transverse ridge, both at its west and east end. We shall endeavour to elucidate this by stating some facts. Four hundred and seven paces beyond the recent rupture, we come to the main branch of the ancient bed, which turns off suddenly from the present bed, to the right, and pursues a south-westerly course for eight hundred paces, to the west end of the

transverse ridge, where it turns to the south for one hundred paces, and then to the southeast inclining to the east for six hundred and fifty paces, keeping most of the way at the foot of the lateral hill, till it arrives at the present bed of the creek, eight hundred and seven paces, nearly south of its commencement, describing rather more than one-half of a circle, the creek forming the chord. The whole length of the ancient bed is about fifteen hundred and fifty paces, equal to the same number of yards.

The ancient bed, from its commencement, to a little beyond the west end of the transverse ridge, a distance of rather over nine hundred paces, is now mostly filled up, that is the bottom. The bed and banks, however, are in general very perceptible; many rounded stones, of different dimensions, resembling those found in the present bed of the creek, are to be seen. At one place there is a small collection of standing water. The soil in the bed, at and near the west end of the ridge, is wet and miry. A few paces below this there is a small pond which is not yet filled up, containing two or more acres, skirted on one side by the lateral hill, and on the other by a deep marsh. A small stream issues out of this pond, and enters the creek at the highway, at the end of the ancient bed.

The ancient bed is in part bordered by alluvions, such as we find above and below its commencement and termination. The flat on the south side of the isolated ridge, which occupies all the space between the foot of the ridge and the ancient and present beds, is gullied in several places by the waters that used to spread over it in floods. Some stones, weighing from one hundred weight, to a ton and upwards, are scattered over its surface, and were, beyond all doubt, brought down by floating masses of ice, which used to descend on the breaking up of the creek. This fact is proved by their shapes, and by their not being in place, and by their surfaces, which bear evident marks of having been rounded, rolled, and smoothed by running waters—besides, we never find stones on river alluvions, unless it be under similar circumstances.

This flat has been wholly formed by the creek, and at a period anterior to the rupture, at the east end of the isolated ridge. The superficial stratum is from two to four feet thick, and rests on a bed composed of rounded stones, pebbles, coarse gravel, fine gravel and sand, jumbled together, evidently brought down by the waters of the stream. The materials composing the bed were brought first, and the alluvions spread over them, last. Both have been laid bare and exposed to view by the digging of a mill-race, by a Mr Nathaniel Ethridge, across the flat. This mill-race is eighty-four rods long, and begins at the highway, on the south side of the ridge, at its eastern end. It is not straight, but winds across the flat, ending at the old bed a little above its termination.

The waters of the creek have, within the memory of many persons now living, been known to flow very profusely in the ancient bed. Indeed, we saw the whole stream flow in it in the month of March 1822. This was occasioned by the sudden breaking up of the creek, and the stoping of the ice in the present bed, from the foot of the old bed, up to near its head, but it continued to flow only four or five days. During this time the stream appeared very natural, so much so, that a stranger would not have supposed a change or shifting.

The oldest inhabitants now living in the neighbourhood say, that the Indians had a tradition of the waters opening a passage at the east end of the insulated ridge, and of their quiting the old bed; but the time, cause and manner are enveloped in oblivion.

We shall venture to make a few suggestions relative to the cause and manner which, although not conclusive, have at least some plausibility.

1. At an unknown period, and before the rupture, the stream near the commencement of the ancient bed, separated and formed an island, which occupied most of the space between its left bank and the ridge, including the creek's present bed, and some flats on the east side.

The branch which flowed on the east and south side of this island, can, at this distant time, be in part, traced along the north

side of the projection and isolated ridge, to its termination in the ancient bed. Its width is eighteen or twenty paces.

2. The waters must have run in considerable quantities in this branch during freshets and floods, and must have worn down, undermined and demolished the ridge where the creek at present passes.

3. The deepest and swiftest water must have been on the side of the ridge, because the direction of the bed, and the elevation of the ridge, both tended to it.

4. As soon as the ridge was broken down, the whole stream rushed through and took this direction, and flowed where the present bed is.

Since then the creek has deepened its bed so much that the commencement of the old bed is about seven feet above the present at low water mark.

Before the breaches were made in the ridge, there must have been a small lake lying behind it of several miles extent.

We shall conclude with some explanatory remarks.

1. The ancient bed is about one thousand five hundred and fifty paces in length, and one hundred in breadth.

2. The chord is eight hundred and seven paces in length—this determines the extent of the new bed—three hundred and fifty paces are south of the ridge, fifty at its base, and four hundred and seven on the north.

3. The original length of the ridge did not vary much from one thousand paces. Of these the isolated portion now comprises six hundred and ten paces, the gap at the west end one hundred, and that at the east end one hundred and forty, while the remainder is contained in the projection.

The base of the ridge is from fifty to one hundred and forty paces broad, and its altitude from twenty-five to about eighty feet. The eastern part, which is the lowest as well as narrowest, bears marks of having been lowered by waters.

4. The lateral hills, immediately along the valley, are not higher than the most elevated parts of the ridge, although they are at a short distance back.

It will be observed that the lateral hills are terminated on the south by the hill lying on the north side of the valley of the Mohawk.

In ascending the creek as far as the foot of the rapids, below Trenton Falls, we see several traces of its ancient bed, seven, eight, nay, twenty-five feet higher than its present. These traces have banks, and are from eighty to one hundred yards broad. They begin and end at the creek. Some exceed six hundred yards in length. We shall instance one of these, which affords a fine example. It is on the right bank, about nine miles above the isolated ridge, and upwards of twenty feet higher than the surface of the present bed. It is bordered by alluvions, but they are very ancient, since we find little or no vegetable earth mixed with them. The present bed of the creek, opposite, above and below this place, is sandstone, containing some lime. The old bed is very crooked, but the new is straight. The bed above and below must have undergone a correspondent depression, or in other words, the bed since the dereliction must have sunk by abrasion, or the wearing of the water, above twenty feet. The present affords more facilities for the rapid descension of the waters.

The bed of this stream must have been much higher before the Mohawk had sunk to its present level at the Little Falls. The ancient banks are in many places faintly marked out. In general, a strip of alluvion lies between these banks and the present. In composition it differs from rock alluvion, or such as has been formed on the spot, or by materials washed from the adjoining hills. The creek alluvion, with few exceptions, may be termed a sandy loam. The Germanflats are indebted to this sandy loam for their extreme fertility.

The ridge, as it is called, on which the village of Herkimer stands, is foreign, being composed of clay, argillaceous loam, sandy loam, sand and gravel, both coarse and fine, round stones, &c., sometimes separated, and at others jumbled together. The whole appear to rest on blue clay and marl. The flats, or river and creek alluvions, environ it. The northwest and north sides of the ridge rise from ten to fourteen feet.

The West Canada creek has, at different periods, flowed on both sides; that is, it has run on the east side and northwest side, between the ridge and hill, southwestwardly; on the east side several beds may be traced between the village and the present bed of the stream. On the northwest side an old bed is also to be seen stretching to the river in that direction. The water occasionally in floods flows in it. The ridge, properly speaking, is a plain. It is difficult to determine how it was formed, unless we suppose it to have been by an immense debacle or clearing up of the creek.

Change in Poultney River in 1783.

A similar change to that in West Canada creek, was made in Poultney river, which empties into East Bay, near White Hall. This river, for several miles before its entrance into the bay, forms the division line between the county of Washington and the State of Vermont. A little above its mouth a ridge of land crosses the valley in a northerly direction. Before the change, the river ran in a northwesterly course to the ridge, where it wheeled suddenly to the right, and flowed northeastwardly half a mile, and then turned to the left, and pursued a westerly direction across the ridge, down a considerable ledge of rocks. For several years before the change the river had gradually worn away the bank on the side of the ridge, just in the bend where the stream turned to the northeast. In the month of May 1783, during a very great freshet, the river at this place broke down the ridge, and meeting with no rock, it wore a channel sixty feet deep, nearly to a level with the stream below, leaving the former channel and falls perfectly dry. The bed of the river, for some distance above the rupture, was lowered or sunk to a great depth, so that the low meadow lands along the stream, which before were inundated by every freshet, have now become dry plains. The earth removed from the bed by the overwhelming torrent, and transported into East Bay, was so considerable as to obstruct the navigation of the bay for some miles. These obstructions, however, have since been removed by the current, to such an extent, that vessels sail up the channel as usual.

The preceding affords a well authenticated instance of a stream nearly equalling the West Canada creek in dimensions, breaking down a barrier, and shifting its bed for nearly or quite a mile. All the circumstances which attended the demolition and dereliction in this case, are known, but none of those which attended the rupture and change in West Canada creek have been transmitted to us. The event happened before the settlement of the country, and therefore the circumstances are buried in oblivion. They might have been similar; probably they were. Time is busied in effacing the old bed of Poultney river, in the same manner that she has been, and still is, that of West Canada creek. A few centuries suffice in removing almost every vestige. Rocks of the softer kind decompose; the banks are levelled by rains and other causes; and alluvial matters are brought into them, and plants and trees take root and grow. Such are the destroying and renovating operations of nature.

In regard to the Agoneasean tradition, we have no reason, although it is not accompained with particulars to doubt its veracity. They could not have made it, had the event not happened; the persons who have given us the account could not have made it. They were illiterate people, and had lived all their lives near the spot. They obtained the account from the Agoneaseah, who formerly lived there, and had for aught we know, before the visiting of America by Columbus.

We shall in this place mention the falling down of two or three acres of land, on the east side of West Canada creek, about half a mile below the last breach made by that creek in the ridge, which we have described as ruptured by that stream. It happened in the summer of 1816, during a very dry time. The east side of the creek, from the Mohawk alluvions, as far up as the projection opposite the isolated ridge, and farther, is skirted by a hill, generally exceeding ninety feet elevation. On the west side it is bordered by flats as far up as the isolated ridge. From the summit of the bank or hill, on the east, the lands are flat or nearly so. The hill is composed of gravel, sand, loam and clay, and many small stones, sometimes in alternate layers, and at others somewhat jumbled, which appears

to have been the case at this place. Along the creek there were several springs which issued from beneath the mass that fell These, it is supposed, must have removed large portions of earth from beneath, and formed a hollow, which became so extended, that the incumbent mass could no longer support itself, and the whole settled down. At the break, in the rear, it sunk perpendicularly about forty feet. The trees were mostly prostrated.

The surface was cracked in many places, and left in fissures and ridges. The whole presented a perfect scene of disorder. Other sinkings have occurred below, but they were less.

Upper Valley of the Mohawk.

This valley begins at the head of Little Falls, and ends about three miles east of Utica, in the Oneida and Seneca vale. Before the barrier at Little Falls was broken down, the lowest part of the valley must have been the bottom of a lake. We speak of it after it had become separated from the lake, which covered most of the Oneida and Seneca vale. This seems to be demonstrated by the soils which compose the flats along the river. These are alluvions, and were brought from the hills and rising grounds which adjoin them, by the streams, which formerly discharged themselves into the lake, and which now discharge themselves into the river. In these alluvions are found lake deposites, such as the trunks and branches of trees, &c. Some of the trunks are occasionally found buried at the depth of fifteen or twenty feet. Along the streams we find logs covered three or four feet with soil. A stream hard by the village of Utica presents some good examples of this kind.

The alluvions, in some places, rest on blue clay, in others on marl or rounded stones, pebbles and gravel. Those along West Canada creek, and within the valley, in general come under the latter description. This has been sufficiently proved by excavations, such as wells, mill-races, &c. All the flats, except the Germanflats, are very low, and before cleared and ditched, were wet and swampy. Those which are still in their

natural state, are the same as formerly. Before the bed of the river was freed from logs and drift wood, the inundations were frequent and extensive, and added to their wetness. In Schuyler and Deerfield, there is a plain ten or twelve miles in length, and from a quarter to one mile in breadth, which is bounded on the north by the foot of Hassenclever mountain, and on the south by the river alluvions. This plain is scarcely less level than the flats, and but little higher. The soils consist mostly of sandy loams, clayey loams and gravel, in which small rounded stones and pebbles are plentifully disseminated. The whole plain has evident marks of having been covered, for a long time, with water. Among the marks we would notice, drifts or heaps of sand and sandy loam, water-worn stones, pebbles, &c. Most of this plain is in what we have denominated the Oneida and Seneca vale.

Ridge Road, or Ancient Beach of Lake Ontario.

The ridge road, as it is called, begins about three miles north of Rochester, at Genesee river, and ends at Lewistown, on Niagara river. It is generally from six to seven miles south of Lake Ontario, and from two to three miles north of the northern steep Its length is about seventy miles. The canal (from Lock Port eastwardly to Rochester) runs near the foot of the steep.

On leaving Rochester, on Genesee river, seven miles south of Lake Ontario, and travelling northwardly, we approach the ridge road by a very easy descent, hardly perceptible to the eye. Where we first come upon it, a little west of the river, it is about seven rods broad, at its base possibly not quite so much, and about five or six feet high. Its summit is flat or nearly so. As we travel westwardly we find it broader and higher, being from seven to twenty or twenty-five rods in breadth, and from six to ten, nay eighteen feet in height. The north side, which drops to the level of the plain, is much more strongly marked than the south. A slope, or kind of steep, is almost every where to be seen. In some places this slope or steep has very much the ap-

pearance of having been made by the falling down and levelling of the ancient bank. The south side of the ridge or beach is not so long or steep as the north. In some instances it passes into the plain without any slope or steep whatever.

The breadth increases as we proceed westwardly. Between Genesee river and Sandy creek, we think it may be estimated at from seven to thirty rods, and in a few places more. After we have left Genesee, for a distance of two miles, it is rarely under eight rods.

The elevation fluctuates between six and eighteen feet. The elevation seems to depend on the surface of the plain on which it is raised.

The slope on the south side is commonly very gentle, sometimes not visible to the eye.

The whole space between the ridge and the lake, is a flat, with an average descent of about fourteen or fifteen feet to the mile, exclusive of the drop or pitch at the shore, which may be computed at from twenty to twenty-five feet more, making in all from one hundred and twenty to one hundred and thirty feet. On the south the ascent is very easy, and does not surpass one hundred and thirty, or one hundred and forty feet. We see nothing of the mountain ridge; we see no hills, no swells; nothing but a plain, whose declination is so very gradual, that the eye can seldom take it in. Indeed, were we to give our opinion respecting the mountain ridge, we should say there was none; and that what has been dignified by that pompous name, is simply a steep or ledge of rocks, which crosses the plain from west to east.

Between Sandy creek and Oak Orchard creek, the ridge preserves nearly the same breadth and height which it does for a few miles east. The country exhibits nearly the same aspect, that is, an almost uninterrupted flat. On crossing Oak Orchard creek the ridge becomes much broader. We often see only one of its sides, usually that on the north.

The lands along the ridge are all cultivable, or may be easily rendered so. Swamps and marshes are very numerous along the southern margin of the ridge. They occupy a consider-

able portion of its whole extent. In general they are narrow, and seem to be occasioned by the ridge, which acts as a kind of barrier or dike to the waters, and compels them to rise and spread at times over the surface.

The swamps are covered with a heavy growth of timber, but the marshes here, as well as every where else, are mostly bare. A little west of Sandy creek, there is a marsh which is two miles and three-quarters in length, and from an eighth to the one-fourth of a mile in breadth. It extends lengthwise along the south side of the ridge. Its surface is covered with marsh grass, here and there diversified with small coppices of bushes, indigenous to such situations. All the swamps and marshes may be drained by opening ditches across the ridge.

The ridge does not cross the ravines of the streams, as has been asserted. We presume, however, that it did originally, leaving only passages for the waters. An inspection of the banks thrown across the mouths of these ravines at the lake, at this day, illustrates this fact. There banks or ridges are stretched quite across, and have no avenues, except where the waters flow. So it must have been at the ridge. The streams, owing to the shifting of the beds, must have long since removed every part of the ridge within the ravines. Besides, it is probable that the beds of the ravines were once on a level with the base of the ridge. From the foregoing facts, it will be seen that the ridge stops on the brinks of the ravines, and that it lies in pieces.

All the streams, with the exception of Oak Orchard creek, which cross the ridge, are small, and have wide beds and broad ravines. These ravines are very sinuous, and deepen as they approach Lake Ontario. Red sandstone forms their beds and banks. The ridge or beach rests either upon or very near this rock, as may be seen in the banks and bottoms of the ravines. In some few places it breaks through the soil and shows itself.

This ridge, or more correctly speaking, beach, is composed of sandy loam, argillaceous loam, clay and gravel: that is, the exterior cover. Within this cover we find lake sand, both fine

and coarse, lake gravel, lake pebbles and lake stones, water-worn stones. The loams are generally yellowish and reddish, differing in shades. The sands are gray and yellow. The colour of the latter is derived from a mixture of clay. Some of the loams and clays are coloured with red sandstone or the oxide of iron. In digging wells and cellars, all these materials are found in descending eight or ten feet. In some instances where wells have been sunk twelve or fifteen feet, shells, logs and other animal and vegetable remains have been discovered in tolerable preservation. The sandy and argillaceous loams abound most on the east side of Oak Orchard creek, while the clays are more prevalent on the west.

We call this ridge the ancient beach of Lake Ontario, because we suppose it to have been formed by the waves of that lake, at a time when its surface was one hundred and thirty feet higher than it now is. The materials which compose this beach were raised by the waves, at no great distance from where they are at present, and thrown up in the same manner that the ocean forms beaches at this day. All beaches are formed of materials taken up by the waves very near the spot.

The surface of this beach has a very different aspect now to what it had when the waves rolled in and beat against it. Then its surface was very much like the surface of those at the mouths of the streams.

The soil which forms the cover, is very old—we could discover no difference between it and the soils in its vicinity.

The line of the ridge or beach is somewhat winding, resembling, in a measure, the present shore of the lake. There is but one bay, and that is nearly north of Lock Port—Eighteen Mile creek runs through it. Its breadth, at its mouth, is about four miles, but what its depth is we do not know, it however, is considerably less. The beach winds around it, and is every where elevated above it—the bay is swampy. In order to shorten the distance, a road has been made across the mouth of the bay. This is the only place, if we except the ravines of streams, where the ridge road quits the beach, in a distance of more than seventy miles.

Portions of this ancient beach are to be seen eastwardly of Genesee river, as far as Oswego river, and westwardly of Niagara river. They lie in pieces, being sometimes interrupted for miles. The interruptions are probably occasioned by the unevenness of the surface, since it is pretty evident that the waves could only form them where the surface or bottom was smooth. Beaches are never formed unless the bottom is smooth and shoaling near and at the shore.

Were examinations made, we have no hesitation in saying, that sufficient portions of this beach might be found to point out nearly the whole extent of country covered by the lake, at the time its waves beat against the ridge we have been describing.

The waters of Lake Ontario, it is likely, decreased very gradually. The Baltic is said to subside at the rate of forty-two inches in a century. If we allow a decrease of half an inch to the year, which would be rather more than that of the Baltic, then three thousand years have elapsed; but if we suppose this too much, and admit only of a decrease of one-quarter of an inch per annum, then six thousand years have elapsed. In these estimates, the ridge is considered to be one hundred and twenty-five feet higher than the present surface of the lake.*

In a few years, the road constructed on this beach, will vie with the best roads in the state. Fifty miles may now be called excellent.

The levels around the eastern end of this lake are no less extraordinary than those on the south side. From Sacketts Harbour, to the village of Watertown, on the east, the country exhibits an almost uniform level. By a recent survey it has been found that the waters of Black river may be taken out a little below the latter village, and carried across the plain, to the former, at a very moderate expense. The same level extends without interruption, to the St. Lawrence.

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* The philosophers of Sweden, say that the waters of the Baltic, annually sink in regular proportion, which they have estimated at half an inch every year. If such be the fact, the flat country around this sea, 2,000 years ago, must have been covered with water.

The plain along the east end is from four to nine or ten miles in breadth, and on the St. Lawrence border, much more.

Some have alleged that they could trace the ancient beach in certain places. This we think very probable, because the waters, when they stood over this plain, must have beat against the shores in the same manner they do at present, and must have thrown up beaches in certain situations. There will be no difficulty in tracing it from place to place, when the country around the lake is cleared and cultivated. Then the sandy loams, clayey loams and sands will be easily recognized.

In the northwest part of the county of Chatauque, there is another of these beaches—it commences a few miles southwest of the mouth of Cattaraugus creek, and extends into Pennsylvania. We are uninformed of its length, breadth, and height. They are, however, less than those of the beach on the south side of Lake Ontario. It occupies a line nearly midway between the present lake shore, and the foot of the Chatauque ridge. It is divided by the ravines of such streams as pass it into pieces. These extend from ravine to ravine, halting on the brinks of each.

There are also occasional interruptions which seem to have been caused by small elevations in the surface of the plain. We have before mentioned that a plain stretches along the southeast side of the lake, from a few miles south of Buffalo, to the Pennsylvania triangle, some over fifty miles in length, with a breadth of from three to eight miles. This beach, like that of Lake Ontario, has its slopes. That facing the lake is the longest, steepest, and best defined. The other is often hardly perceptible, the border consisting of swamps and marshes occasioned by the beach.

The country has a gradual declivity on the one hand, to the lake shore, and a gradual acclivity on the other, to the base of the Chatauque ridge. The whole has the appearance of a very moderately inclined plain, rising from the lake and terminating in the ridge.

The beach itself consists of sandy loams, argillaceous loams,

gravel, pebbles, and small stones, obviously heaped by the pristine waves of Lake Erie.

Slate underlays the plain through which this beach runs. It is seen all along the lake shore, in shelving ledges and in cliffs. It is also seen in the beds of all the torrents that rush down the side of the Chatauque ridge, and fall into the lake after having crossed this plain.

This beach, it is probable, was formed before the Niagara had levelled the barrier at Black Rock and hereabouts. It will be remembered that the southern steep or ledge crosses the river hereabouts, and stretches eastwardly across the country almost to Genesee river.

Inland Seas, Lakes, &c.

Before the waters of the inland seas had broken down their barriers, and while large portions passed off by the St Lawrence and Mohawk, at Fall Hill, the great plain noted as well as the plains west of Niagara strait, must have been covered with sedentary waters, to the height of from two to four hundred feet, and lakes Ontario, Erie, Huron, Michigan and Superior must have formed but a single expanse. All the low countries around and between these lakes, must have been submerged, and nothing must have appeared but a liquid plain, except the few eminences we now see rising above these low lands, which then appeared as so many islands. At that time the waters discharged by the St. Lawrence and Mohawk drains, must have been vastly larger and more voluminous than they now are. Other inland seas or lakes must have existed below this, such as that of the Hudson, and that of the lower St. Lawrence, united by Lake Champlain. The Highlands at West Point, and the mountains in the vicinity of the city of Quebec must have been the barriers which separated them from the ocean, while the Nose and Fall Hill, on the Mohawk, and similar barriers on the upper St. Lawrence, separated them from the preceding. The ocean, at that time, must have come up to the feet or sides of the lower barriers. Lake Champlain, at this

day, has an elevation of only eighty-six feet above the tide waters of the Hudson, at Troy, and not over one hundred above those of the St. Lawrence, at Three Rivers, where the tide ceases to flow. The summit between Hudson's river and Lake Champlain, is only fifty four feet higher, making in all but one hundred and forty feet. An accumulation of water, at this day, in the St. Lawrence and Hudson basins, to the height of only one hundred and fifty feet, would more than suffice to unite them together, and form a lake of three hundred and fifty miles or upwards in length.

It is not improbable but that considerable bodies of water were formerly discharged by the drain on the side of Lake Champlain. For whoever examines the narrow bed of that lake, from Crown Point southwardly to White Hall, at its head, and the valley through which Wood creek from Fort Ann flows, will find abundance of proofs corroberative of this fact. The lake itself is a mere straight or river, so very narrow in some parts that a man can throw a stone across, and appears rather to have been delved out by waters than otherwise. Add to this the water-worn cavities in the rocky barriers along the valley of Wood creek, fifty or sixty feet above its present bed, and it seems to be demonstrated to an almost certainty. From these facts it seems then that in the latter ages of the lake, the water must have flown off both ways, that is by Wood creek and the narrow strait of Lake Champlain, and through the Highlands at West Point. The waters of Lake Champlain have obviously subsided since its separation from the Hudson and St. Lawrence basins; that is, since the waters of those basins stood so high as to meet and constitute but a single lake. Mr. Williams, in his history of Vermont, has these remarkable words: "There are many marks and indications that the surface of this lake was formerly thirty or forty feet higher than it is now. The rocks in several places appear to be marked and stained with the former surface of the lake, many feet higher than it has been from its first discovery by M. Champlain, in 1608. Fossil shells, the limbs and bodies of trees are frequently found at the depth of fifteen or twenty feet

in the earth; this is the case not only along the shores, but in the low lands, at the distance of two or three miles from them. The soil in many places along the shore is evidently of the same factitious kind as the intervals formed by the rivers. These and other circumstances have left no doubt in the minds of the inhabitants along the lake shore, that the waters of it were formerly much higher, and spread to a much greater extent than they now are."

Whenever, therefore, the original lake became disparted by the subsidance of the surface, Lake Champlain communicated with the St. Lawrence basin; that is, the lake, which occupied the flat country along that river. At first the communication or drain must have been short, and its bed much more elevated than it is now. As the surface of the lake however, along that river sunk, and its limits became more contracted, the Champlain drain lengthened and deepened, and the lake's surface also sunk and became more contracted. Hence the depression and contraction spoken of by Mr. Williams. Hence the emergence of those low lands in which fossil shells, the limbs and bodies of trees are found buried at the depth of fifteen or twenty feet. Hence the origin of the factitious soil, resembling that along rivers, and which has not had time to acquire consistence and firmness.

The banks of the St. Lawrence, from the city of Quebec to the head of St. Francis' lake, are in general low, and in some places marshy and swampy; the country in rear of the banks, for some distance, is also low, and often wet, swampy and marshy; no hills, no mountains of magnitude appear, a few isolated instances excepted. In this extent there are still three lakes remaining through which the river runs. The first is St. Peter's, and is twenty-one miles in length, with an average breadth of ten or twelve miles—the second is lake St. Louis, and is sixteen miles long and from two to seven broad—the third is lake St. Francis, and exceeds thirty miles in length and four in breadth at a medium. The two latter are divided by a a strait, about six miles long. The country from Montreal to Lake Champlain is an almost uniform level. On the left bank

of the Sorel, immediately after its exit out of Lake Champlain, there is a swamp of great extent, the country however, rises very gently on that side. The whole country between the Sorel, above Mount Belisle and the St. Lawrence, and thence up and down that river, within the limits we have mentioned, and we might add a large tract along the Ottouwas, from its mouth, upwardly some way, have every mark and appearance of having once been the bottom of a vast lake. The extended levels, the lowness of the lands, their wet, swampy and marshy aspect, the fragments or remains of a great lake, the looseness, and want of firmness in some of the soils, their alluvial character, are all demonstrations of the previous existence of a lake, and these combined with the appearances of the subsidance of Lake Champlain, and the water-worn traces in the cliffs along Wood creek, all go to show that it was connected with that along the Hudson, whose drain was at West Point.

The retrocession of the waters of the inland seas must have been gradual. The seas at first must have been salt, and their waters must have afterwards freshened slowly by saline deposits, discharges at their drains and renewals from the streams of fresh water which were constantly falling into them. The process was very much like the dilution of milk, or the reduction of spirits by water. A constant discharge of water will dissipate milk or spirits. So constant discharges of fresh water into these seas or lakes would have weakened and dissipated the salt water, unless they had had the same means of renovation which those of the ocean have.

In the retrocession and subsidance of the inland sea, which covered the great plain of the west, the Oneida and Seneca vale, and the tracts of land contiguous to Lake Ontario and the other great lakes, we think we can discover five distinct periods.

The first of these periods was the time when the barriers on the upper St. Lawrence and that at Fall Hill, on the Mohawk, were entire, and acting as mounds, kept the waters level with the lowest parts of their summits. Then all the country within these levels was one large sea.

In the course of time, and from the constant action of the waters which flowed off at these parts, the beds deepened, and the surface sunk below the level of some part of the table land, now between lakes Erie and Ontario, whereby those lakes become disparted. The southern steep must have formed the line of demarcation between them. The beds of salt were partly deposited during this period.

The second of these periods was the time when the waters of Lake Ontario occupied all the country southwardly to the foot of the southern steep. During this period they retired in consequence of the farther deepening of the drains, and the lowering of the surface, as far as the northern steep. We mean the steep east of Lock Port, and south of the canal.

It was during the second period that the beds of gypsum, found on the north side of the limestone ridge, and sometimes as at Cayuga lake, and some other places, where it dips, were deposited. These beds are almost every where below the limestone, and are of posterior formation.

The completion of the salt depositions happened in the early part of this period.

Beds of gypsum are now forming in Lake Ontario, out of the calcareous and argillaceous matters carried down by the Niagara.

The third of these periods was the time when the waters occupied the space between the south side of the ridge road, and the northern steep.

In this period the waters had became freshened. It is therefore to this period we must attribute the formation of the water limestone, &c. and many of the marly deposites found in the Oneida and Seneca vale. The water limestone is a fresh water formation.

It was towards the latter part of this period that the lake which covered the Oneida and Seneca vale, became detached, and constituted a separate lake.

The fourth period was the time when the waters of Lake Ontario covered the space between the ridge road and the present shore of the lake. In the early part of this period the

beach, improperly called the ridge road, was thrown up. In after times the waters retired gradually within their present barriers.

The fifth of these periods comprises the time since the waters of the lake were confined within their present brim. Here there was a natural offset, or dip; so there were at the northern and southern steeps.

The retrocession and subsidance of the waters of this inland sea, and of the lakes formed out of it, must have been more rapid in the first, second and third periods, than they have been since, because the barriers, at the drains, had less breadth than they have since had. The volumes of water discharged during those periods, must also have been much larger than they have been since, owing to the surfaces being greater, and the beds of the outlets lowering faster.

The discharge, during the fourth period, must have been more considerable than since, as the barriers are annually widening and presenting greater obstacles.

We shall limit the remaining remarks to the subsidance of the waters of Lake Ontario, commencing with the topography of the country around it.

We have already observed that the country between this lake and Erie is a plain, divided into three parts, by two steeps, which extend lengthwise through it, from west to east. The upper steep crosses the Niagara river at Black Rock, and its vicinity.

The lower steep crosses the river, about fourteen miles lower down, at Queenstown and Lewistown. It is the highest and and of greatest extent, environing nearly two-thirds of the lake. In travelling westwardly, it is first seen a little west of Genesee river, and about nine miles south of the lake. From thence, it extends westwardly, to the extreme part of Burlington bay, at the head of the lake: here it bends around to the north and northwest, for thirty-eight or forty miles, where it turns and pursues an easterly direction, to Trent river, near the head of the bay of Quinty a distance of one hundred and sixteen miles—it then runs up that river, some miles, and crosses it. This steep, at the distance of eighteen or twenty miles, from where it takes an

easterly course, separates into two parts, which stretch in parallel lines, keeping from three to six or seven miles apart. The southern, in its progress eastwardly, approaches the lake by degrees, so that, at the river Trent, it is distant only two or three miles. Both are very uniform. The country, from the lake to the base of the first, is a champaign or flat, so from its summit to the foot of the second—the third plain is quite level. This plain slopes towards Trent river and Lake Huron—these steeps, whether on the north or south side of the lake are prolonged in hills and rises, eastwardly on one side, and east northeast on the other, to the lower part of the thousand islands, where they approach the St. Lawrence, forming a kind of basin, which comprises nearly or quite double what the present lake does. Almost every where within this basin the land is low and flat, and rises gently from the lake shore to the foot of the steep, and the eminences and hills. From Niagara river, to Big Sandy, in Jefferson county, this plain fluctuates between two and nine miles. At Niagara it is seven, at Rochester nine, and at Richland in Oswego two. After it passes Big Sandy, it widens.

That the limits of this lake have been restricted, scarcely admits of a doubt. The ancient beach, which still exists in part, appears in many places.—Between Niagara and Genesee rivers, a distance of more than seventy miles, it is almost entire, and between the latter stream and Oswego river, so much of it remains that it can be easily traced. The deposites of argillaceous and calcareous marls and shells leads to this conclusion. The aspect of the country has every appearance of having been submerged by waters, which have subsequently abandoned it. If we go back to the more ancient period, when the waters of the lake covered the Oneida and Seneca vale, we may find abundance of facts corroberative of it. The plain on which the village of Rome stands, and the adjacent swamps, are mostly alluvions. The subsoil was brought by waters, and deposited, and probably about the time the lake hereabouts became shoal.

In excavations made in the plain and swamps, since the settling of the country, the branches and bodies of trees have

been found at various depths, and some at even thirty feet. Now the inference to be drawn from these, is, that the bottom was where these logs are found at the time they were brought, and that the covering happened afterwards. There are no streams at this day hereabouts which could have had any agency in furnishing materials to cover them.

In the deposites around Onondaga lake, the trunks and branches of trees have been found. On opening a new drain to this lake, in order to lower its surface, whole cedar trees were discovered in the marl bed, extending from the lake to Seneca river. Some were six or seven feet below the surface, while others were not over one. The logs in the bottom of the drain must have been found by the waters where covered. Few, or none bear marks of having been brought from any considerable distance.

Nearly the same deposites exist around the head of the lake, and it is probable along its western margin, and up Nine Mile creek two or three miles. The whole flat is swampy and marshy, and owes its origin to successive depositions and lowerings. In these deposites logs and branches of trees have been found. No regular layers are in general met with, since marl is sometimes at the bottom, and at others clay, mud, or some other earthy substance.

Deposites are of very frequent occurrence in different parts of the Oneida and Seneca vale, and constitute no inconsiderable portion of the whole.

Inexhaustible beds of marl, abounding with shells, are found in Manlius alluvions, a few miles east of Salina.

Extensive beds are found west of Otisco, or Nine Mile creek, on the line of the Erie canal.

Marl occurs in the swamp south southwest of Rome.

In the vicinity of Richland, in the county of Oswego, upwards of two miles from Lake Ontario, there is a slaty ledge, which contains myriads of small shells. The bed of Salmon river, which is in sight, and which is seventy or eighty feet lower, is a blackish slate. The ledge containing the shells, reposes on the latter rock. The shells are entire. From a review of the

facts, the conclusion seems to be that the waters of the lake came up to this place, and that the prototypes of these organic remains lived and died where found, and that the rock was afterwards formed

What now constitutes the ground of the ledge must then have been mud; and this mud must have been augmented by the waters which probably rolled over this place, and the shells must have been covered from time to time.

The waters of Seneca lake, since they became detached from the inland seas, and lakes, which once existed, have subsided and left considerable tracts of land bare. The marsh, at the south end, and the grounds at the north end, afford examples. This lake, we have reason to believe, had two drains before it had fallen to its present level. These drains appear to have commenced above the village of Waterloo, and about three miles and a-half below the present outlet, and to have diverged. The present outlet occupies one of these drains—the other is dry, and crosses the road a little above the village. When the waters flowed off by these drains, the lake was many feet higher than it now is. The outlets must have been at the divergence; and the plain westwardly to Geneva, must have been covered with water. The lands bordering the river, from this point, up to the lake, are low, flat and marshy. Cultivation may, in some measure, render them suitable for meadows. The river, or outlet as it is called, is deep, and very sluggish, and bounded by low banks.

The county, on the north side of Seneca outlet, and on the south side, for a short distance, is a plain.

Cayuga lake has sunk since its detachment from the lake, which anciently stood over the Seneca and Oneida vale. The vale of Ithaca, and the Montezuma marshes are evidences of the sinking. The former is at the head, and the latter are at the foot of the lake. The marshes are twelve or fourteen miles long. In the spring they are covered and form part of the lake. Since the abrasion of the rocks at Jacks reefs below Cross lake, by which the bed of Seneca river has been deepened, the surface of the lake has lowered so much that it does not now include the marshes, except in the spring.

The lakes and ponds which are situated in the middle part of the basin of the Hudson, are the ruins of the lake which covered the country between the Highlands and the summit level, between Wood creek and the Hudson, near Sandy Hill. Saratoga lake, which is the largest, is about eight miles long, and from two to three broad.

Before the waters of Genesee river had formed the ravine, from Rochester to Carthage, and while they still flowed on the summit of the plain, there must have been a lake above the former place. This lake must have commenced not far from the foot of the Alleghany hills, and extended downwardly to the vicinity of Rochester, and occupied the lowest part of the plain through which the stream now makes its way. This lake, which had no great depth, was destroyed by the lowering of the drain at and near Rochester, and the accumulation of alluvial matters brought down by the streams which fell into it. The extensive bottoms along the banks of the river owe their origin to deposites. These, in some places, are two miles broad.

In the town of Avon there is a pond nearly two miles in length, which is not yet filled up. This pond is situated in the Genesee flats.

A small lake once existed at Schenectady, and its vicinity. Some traces may be seen in a small pond, situated about three-quarters of a mile north northwest from the city. The foot of the lake must have been three or four miles below the city, and the head six or seven above. Its breadth was two miles in some places. The broadest part was in the vicinity of the city. During its existence, the greater part of the alluvial matters composing the flats hereabouts, were brought down and deposited in its waters, where they subsided. The bottom, by these accumulations, gradually rose, and as the outlet sunk by the abrasion of the rocks, it became entirely disengaged, leaving nothing but a course for the river. The river, for seven or eight miles, presents a smooth stretch of still water.

A blackish shistic rock underlays the river and flats. The

soil of the flats is composed of fine alluvial earth, of extreme fertility.

The pond shows an imperfect filling up, and is entirely out of the course of the stream.

The Mohawk now, as in former times, brings down considerable earths.

All the flats, or bottom lands, along the Mohawk, have been formed by earthy matters transported by the streams. The oldest compose the clays, gravels and sands, and the newest the rich alluvions. The former were mostly deposited while its valley was composed of lakes, connected by short straits. The blue clay derived its colour from the water in which it was deposited. It was at first mud. The blackish vegetable earths have been formed on the spots where now found from grass and timber which succeeded each other—the alluvions are finer as we descend the stream.

Split Rock.

In the town of Essex, in the county of Essex, on Lake Champlain, there is a curious split rock. The whole coast of the lake, for a number of miles is formed by rude and rocky mountains, which seem to hang over the water, and threaten the passing sailor. From one of these cliffs, a rocky promontory projected about fifty yards. By some violent convulsion of nature, it has been broken off and removed from the main rock, about twenty feet. The opposite sides exactly fit each other, the prominences of each corresponding perfectly with the cavities of the other. The point broken off contains about half an acre, and is covered with wood. The height of the rock above the water on each side of the fissure is about twelve feet.

GEN. WOOLSEY.

In the town of Cobuskill, in the county of Schoharie, there is a small stream which sinks beneath the fissures of calcareous rocks, and after a subterraneous course of about four miles, emerges in a large basin, eighteen or twenty rods in circumfer-

ence. From this basin, a stream issues, on which are mills at the distance of twenty rods. The basin is about a mile and a-half east of the meeting-house. The identity of the emergent stream, being the one that sinks, is proved by its disgorging saw-dust and other things which it had ingulphed.

Chyle.

The Chyle is in the town of Springfield, in the northern part of the county of Otsego, about two miles westwardly of the springs which form the Osquake creek. It is on the summit of the limestone formation, stretching from Coeymans, in the county of Albany, westwardly into Upper Canada. The country, in its vicinity, is beautifully diversified with moderate swells and ridges, while in the back ground to the south, the hills of Otsego are seen swelling into grandeur. The Chyle is a kind of tunnel, of an oval form, measuring about eighty yards in circuit at the top of the brim. It slopes inwardly, and is not far from twelve feet in depth. Its bottom and sides are limestone, partially covered with earth. There are two or three small orifices or crannies in the former, which serve to conduct away the waters of a small stream that falls into the basin after heavy rains, or the melting of the snow—the discharge of water into this basin is such as to fill it, and occasionally cover two acres of ground around it. The water, when the basin is raised, has a gyratory motion. The issue, from the subterraneous passage, is unknown.

About half a mile northwest of Little Falls, there is a hole several yards in circumference, in the limestone rocks, which ingulphs a stream.

Caves.

In Brownville, in the county of Jefferson, opposite to the village of Watertown, there is a cave. The entrance is about ten rods from the falls nearly northwesterly. The aperture leading into it, is on the surface of the earth, and is about four

or five feet in breadth. The descent is about fifteen feet, and by steps. The steps consist of the limestone layers, adjusted in the form of stairs. After descending the stairway, and advancing a few paces, the visitor finds himself in a large cavity of unknown dimensions. As he advances he passes through avenues and rooms, which seem to meet him on all sides. One of these leads down to the river, but as its termination is considerably below the surface of the water, there is no passing out on this side. The floor and roof are very uneven and irregular, now concave, then convex. The former is plentifully strewed with fragments of rocks both large and small, which have fallen from time to time from the latter, and which now in innumerable instances serve as rude pillars, or supports for the roof. The distance from the floor to the roof, owing to the concavities and convexities in the rock, varies from three to twelve feet, and possibly more. The floor is covered with calcareous matter of the colour of lime slackened. This matter is daily accumulating in consequence of the decomposition above and around. It is wet, and in places so miry, that it is absolutely necessary to use the utmost precaution in travelling over it to prevent getting mired. There is a constant dropping of water from above, which renders a visit quite unpleasant. The roof, walls, pillars and fragments are covered with calcareous depositions which have hardened, and are daily hardening, in this dark recess, and which at present constitute integral parts. Some of these depositions are dependant from the roof and walls in the form of stalactites.

There are several springs and rills of clear water in it.

Secondary limestone underlays the country all around to a considerable distance.

There are several other caves in Black river country, but we are not informed in regard to their numbers and dimensions. Caves are of common occurrence in all limestone countries.

Mitchell's cave, in the town of Root, in the county of Montgomery, is on the south side of the Mohawk river, about one hundred rods southerly of the lofty cliff opposite to Anthony's Nose. The country for a short distance around is level.

The entrance is on this level by a small opening. You descend this about fifteen feet almost perpendicularly, when you arrive in a room about thirty feet long, twelve feet broad, and fourteen feet high. After passing through this room, you enter a narrow avenue which leads you into a second room about forty feet long, twenty feet broad, and thirty feet high. The avenue leading from the first room into this has a rapid descent. A door on the right of this room conducts into a third room which is sixty feet long, fifty feet wide, and from thirty to fifty feet high. This room is closed on all sides but its entrance, consequently you have to retrace your steps into the second. From this you descend a narrow winding passage which brings you into a fourth room. A passage leads you from this down into a fifth room. From this you are introduced by a hall into a sixth, &c.

This cave has been but partially explored. The roof, walls and floor are generally covered with calcareous incrustations. From some of the vaults and walls beautiful stalactites are seen pendant.

The floor is very wet, owing to the constant dropping of water from above.

There is a cave at Rhinebeck, in Dutchess county. The entrance between two large rocks on the declivity of a hill, is a short and small horizontal passage, ending in a perpendicular descent of four feet. A narrow passage leads from this to a room thirteen feet long and ten or twelve broad.

Calcareous stalactites depend from the roof while stalagmites rise from the floor.

These have, in some measure, met and form solid pillars, reaching from the roof to the floor. Some are upwards of eight inches in diameter.

For an account of the caverns at the Heldeberg, we refer the reader to the *American Magazine for September* 1815.

Stone Bridge creek, in its way to Schroon river, runs under a hill, the base of which is seventy yards broad. The stream enters in two parts, which after reuniting emerge on the opposite side of the hill. The subterranean passage may be traced nearly

fifty yards, where it contracts, forbidding all farther ingress. The fury of the torrent, and the thundering noise within, strike the beholder with awe.

The entrance under the hill, is about thirty rods south of the Essex boundary.

Natural Canal.

This highly interesting work is in the county of St. Lawrence, eleven or twelve miles south southeasterly from the village of Ogdensburgh, on the St. Lawrence river. It is between five and six miles in length, and from thirty-five to seventy yards in breadth, extending in a west southwest direction, from a point on the River Grass, to a point on the River Oswegatchie, and connecting them together. The descent is from the former to the latter river, and is estimated at four feet. In rises and floods the Grass discharges so much of its waters into the Oswegatchie, that loaded batteaux pass up and down. In droughts, and in a decreased state of the waters of the Grass, it is impassable in consequence of obstructions, occasioned by the falling in of its banks, and other matters. The country is very level on all sides. By this link an island of forty miles in length and from one to eleven or twelve in breadth, is formed; containing 150,000 or 160,000 acres of land. Its form is triangular; the St. Lawrence is on one side, the Grass and canal on another, and the Oswegatchie on a third.

Petrifactions.

At the Osquake, in the town of Stark, in the county of Herkimer are numerous petrifactions and incrustations or tufas. They are at above and below the mills of the Messrs. Richard and Daniel Van Horne, and near the sources of the Osquake. They are very widely disseminated over the valley, or rather dell, of the Osquake, and some ravines that open into it. The mills are about nine miles south of the Mohawk river.

The Osquake creek is formed by the union of three springs,

which issue out of the ground, in a meadow at the foot of a hill, about three-quarters of a mile above the mills. The volume of water is sufficient for a mill in the driest season.

The dell commences just below the springs, and extends downwardly two or three miles, and then spreads into a valley. The lower part of the dell, and thence up to the first mill, is paved with grey wacke slate of a blackish colour, as may be seen in the bed of the stream, and the upper part, or that above the lower mill, with sandstone of a greyish hue.

Above the grey sandstone, and in the sides of the dell, we see some red sandstone and oxide of iron, and still higher calcareous sandstone and limestone. The dell then may be said to be on the skirt of the great limestone formation, extending from Coeymans, in the county of Albany, westwardly into Upper Canada.

The petrifactions and incrustations are in the bottoms and on the declivities of the dell and ravines in separate masses.

The most perfect petrifactions which we saw are in the ravine of a small stream that descends into the Osquake. They are on the right as you ascend the ravine, and ten or twelve rods north of the road leading up the Osquake, nearly half a mile above the mills. They consist of a mass from twenty to twenty-five feet in length, and from two to five or six feet in breadth, with a thickness of two, three, or more feet. The mass extends lengthwise up the declivity, bounding that side of the ravine, and is composed partly of petrifactions and partly of incrustations. The lower part exposes to view the trunk of a hemlock tree, about two feet in diameter, while the other parts exhibit several fragments of the trunks of the same kind of tree. The trunk is very perfect. The transition from wood to tufa has been effected with so much precision that the forms of the concentric layers, coatings or rings, vesicles, gum and knots are preserved. In short, we might add the whole ligneous structure. The exterior of the trunk, fragments and incrustation is a dark grey. The interior of the trunk, when first exposed, has very much the appearance of hemlock soaked in water, but the action of the air soon changes it, giving it a greyish hue.

Petrifaction has ceased at this spot—the waters which formerly issued out of the declivity above the mass, having from some cause failed or been diverted.

Several other incrustations are to be seen in the same ravine, but they envelop few petrifactions.

The waters gushing out of the declivities along this ravine, are so highly impregnated with calcareous and other matters, that they incrust bits of wood and limbs which get into the stream.

The limy depositions and petrifactions are however the most numerous, and of the largest dimensions in the dell of the Osquake, because the hills are the highest, and the springs most abundant. Some of the depositions extend several rods along the sides of the hills, while others stretch nearly across the bottom of the dell. There is a fine example of the latter about half a mile above the mills. Here a tufaceous rock, of an enormous size, stretches from the foot of the hill on the north side of the dell to the creek on the south side, being a distance of sixty or seventy yards. Its breadth is from eight to sixteen yards, and its height from one to three yards. It is so deeply imbeded that its entire thicknes cannot be ascertained. The road passes through it near the foot of the hill, a passage having been cut. On the sides of the passage we see pieces of wood and other things, which chance brought there, while the mass was forming, petrified, and now composing integral parts.

These calcareous depositions are found in most places where the waters now issue out of the sides of the hills, and in others, where they used to issue out, but have stopped. The ground around these springs is usually wet and miry, owing to the issues being small and numerous, and also owing to matters left by the waters. Incrustation and petrifaction are therefore still going on as in former times, but on a less scale, owing to a diminution in the waters, and impediments occasioned by clearing the ground.

The incrustations and petrifactions on the northeast side of the Osquake, at the distance of four miles, nearly north from the mills of the Messrs. Van Horne's, are very interesting—they are near the base of the same limestone formation.

Petrifactions are found along the Chitteningo, in Sullivan, Madison county.

Those most interesting are on the east side of the creek, and south of the Seneca turnpike. They are at the foot of the hill, near the highway, and consist of the trunks of trees. The woody structure, in some instances, is remarkably perfect, almost resembling the original. Water issues out of the hill sides, in a great many places, in the vicinity of these petrifactions. Incrustations (rocks of tufa) occur on the slopes of the hills and in the valley.

Those found in the latter have in general rolled down.

The carbonate of lime, at the Osquake, seems to be the main ingredient in these petrifactions and tufas. Some aluminous matter, however, appears to be blended with the carbonate—this is what we might expect from the clays and loams covering the hills and their declivities. The waters issuing from the three great springs which form the creek, contain the most carbonate, because they emerge immediately from beneath the limestone, while the smaller ones run through, or make their way down declivities covered mostly with clay and loam.

In the deep winding dell, through which Otisco outlet, or Nine Mile creek runs, incrustations and petrifactions are not of unfrequent occurrence. They occur mostly between the village of Marcellus and the Erie canal. This creek crosses the same limestone formation. The specimens which we have seen petrified, were less perfect than those found at the Osquake and Chitteningo, but were sufficiently determinate to announce the kind of wood.

The following extract was taken from letters published by Mr. Clinton, late Governor of this State, under the signature of Hibernicus.

"On the bank of Otisco outlet, in the town of Marcellus, in the county of Onondaga, there is a petrified tree, in part covered by limestone, which has either been formed by precipitation since the transmutation, or else it has slipped down from above. The limestone hereabouts reposes on slate."

At the Osquake, Chitteningo, and in Camillus, there are several varieties of petrified wood, reeds, &c. The wood sometimes appears to have been in a sound state at the era of petrifaction, while in others it appears to have been in a decayed state before the process or transmutation commenced. In the latter, it is tender as well as hard and brittle, and contains fragments of wood. The same phenomena we think may occur, in some instances, where the wood was sound at the time petrifaction began. These would depend on various causes, such as saturation, exposure, and volume of water, together with the increase or decrease of the latter. Water is the agent and solvent, and it may bring the materials in too great or too small quantities. In either case the petrifaction would be incomplete—part would be petrified, part would be incrusted, and part enveloped. The latter would be sound, rotten or otherwise, according to circumstances. Again, every part of wood is not subject to the same rapidity of decay. The trunk, or branch of a tree, which gets into the course of a stream is apt to decay in some places before it does in others; these are first penetrated by the stony matter, while the other parts are only incrusted. Here then is an example of petrifaction ensuing in parts, while the rest is only incrusted or covered with a stony substance. The careful examiner may find examples of this kind along these streams, and more especially along the Osquake.

In all limestone countries, petrified wood is found. The condition in which it is, is very variable. Sometimes it appears to have been sound when the metamorphosis began, and sometimes decayed, at others petrifaction and bituminization have gone on together.

Observations on Petrifaction

Water is the chief agent which nature employs in petrifaction. Trunks of trees, with their limbs, plants and land, and marine animals have been found petrified in every country on our globe. These, whenever they bear a strong resemblance to their originals or prototypes, are always regarded as objects of extreme curiosity.

Petrifactions differ exceedingly in colour, constituents, and other circumstances. These differences, depend in a measure, on the matters which the waters hold in suspension and solution. All waters have the property of petrifaction, when they are charged with certain earthy substances, in some determinate manner. But how petrifaction is performed we cannot say with precision. In this order of things, all that we can do is to summon conjecture. We cannot arrive at certainties. The archieves of nature are closed to our limited capacities—we have not the keys to unlock them—conjecture may be right and it may be wrong.

First, All waters hold more or less calcareous, aluminous, silicious, or other terrestrious matters in suspension or solution: suspension supposes a separation of the terrene or other matters, solution supposes a combination.

Second, These the waters deposite sooner or later in their transits, to rivers, lakes, and oceans, leaving them along their beds and borders.

Third, Trunks of trees, limbs, plants, &c. which get in their courses, in certain instances, and under a combination of certain circumstances, undergo this astonishing metamorphosis.

Fourth, It would seem that the waters holding the terrene materials of petrifaction attack the external parts first, and then the internal. They penetrate every part. The whole mass becomes wet and then spongy. A decay and decomposition ensue. As these progress, the waters enter with more freedom, and pass through as they do through a spongy substance, removing imperceptibly, the parts in the highest state of decay, leaving in their place the terrene matters which they hold in suspension. This process they keep up until they have destroyed and dissipated all the woody parts, supplying at the same time those parts with earthy matters, which assume the colour and shape of the original. In some instances the waters dissolve the wood.

Constant running water, constant submersion, or constant saturation are indispensible to the petrifaction of wood.

Such are our conjectures, but they do not appear satisfactory to us. We know the agent to be water—we know this to be the solvent. But a difficulty occurs which we cannot explain to our own satisfaction, it is this:—how is the transportation of the one, and the substitution of the other effected, and this in such a manner that the ligneous layers, the ligneous colour, the ligneous form, and every thing is preserved without the preservation of the wood itself? The size, the colour, the texture, the form, and most minute organization, are perfectly preserved, and yet the whole ligneous or vegetable substance is entirely annihilated.

CHAPTER XI.

GEOLOGY.

Four of the five grand classes of rocks, as established by modern geologists, and designated by the names primitive, transition, secondary and alluvial, are found in the State of New-York. In this chapter we shall endeavour to give an outline of each and nothing more. This is all the reader can expect in a work of this kind. Again, the geology of the State is too little known to attempt any thing beyond an outline. In doing this we shall commence with the primitive rocks.

CLASS I.

Primitive.

Granite . . .	Clay Slate.
Sienite . . .	Steatite.
Gneiss . . .	Limestone.
Hornblende . .	Trap.
Mica Slate . .	Serpentine.

The primitive class of rocks occupies portions of the northern and southeastern parts of the State, and is divided into two large districts by the transition clay slate, grey wacke, &c. which lie between them.

First, the northern district. This district is bounded on the north and northwest, by a portion of the transition district on the west, or rather southwest by the second great limestone district, which we consider to be of secondary formation ; on the south and southeast by another portion of the transition district, and on the east by Lake Champlain. We shall endeavour to portray its outlines, in order to convey more correct

ideas to the reader. The line begins at or near the head of Cumberland bay, on the west side of Lake Champlain, in the county of Clinton, and runs northwesterly within three or four miles of latitude forty-five, which is the boundary of the State on the north, where it turns, making a sweep, and runs southwesterly through the counties of Franklin and St. Lawrence, to Wilna, in the county of Jefferson. Here it makes another turn and runs up Black river, whose range, in this part of its course, is south southeasterly to near the mouth of Black creek, in the northeasterly part of the county of Oneida, where it crosses over to the West Canada creek, not far from its forks, which are five miles above the head of Trenton Falls. Its general direction then to the termination of the Palmertown range of the Saconda-ga mountains, is easterly, inclining some to the southeast, but very irregular. The line passes through the counties of Herkimer and Montgomery, and through nearly two-thirds of Saratoga county. From the end of the Palmertown range to the head of South bay, on Lake Champlain, the line is about northeast. The latter lake, as we have before observed, constitutes the residue. Within these boundaries there are some small patches which belong to the transition and secondary classes of rocks. The lines of separation are not as yet well settled. On the south, the primitive rocks composing the mountain ranges, advance into the transition and secondary districts, while the rocks of those districts occupy the intervening spaces. The Clinton range, which ends at Anthony's Nose, on the left bank of the Mohawk, in the county of Montgomery, and the Chateaugua range, which ends at the Little Falls, or rather to the south of those falls, in the county of Herkimer, may be given as two conspicuous examples. The latter range, however, dips before it reaches the falls, and passes under the newer rocks. Several of the other ranges advance within a few miles of the Mohawk before they disappear. It is by no means uncommon to see them dip several times before they pass entirely out of sight. In travelling across the country between Trenton Falls and Saratoga Springs, we alternately cross rocks in *situ*, belonging to the three classes. On diverging from this line, we

can follow them northerly and southerly. On the one hand the primitive become more prevalent at every advance, till they supersede the transition and secondary, and on the other hand the latter increase till they overspread the former. The primitive ranges on and near the line have elevated and depressed summits, which are sometimes above and sometimes below the more recent rocks. Fall Hill is covered for some miles before it reaches the Mohawk, whose waters have cut it down to its base, and laid the rocks bare. The rocks, however, composing its nucleus, immediately after quitting the defile, pass again out of view. The eastern declivity of this hill is mostly covered with grey wacke slate, of a blackish colour, while the western is not only covered but partly composed of calcareous sandstone, capped with limestone. On the north side of the river, a little back from the defile through which the river flows, the covering of the hill is limestone. Wacke covers that part of the hill's summit which is southerly of the river. The line of Fall Hill is easily traced from the foot of the Osquake Hill, in the town of Germanflats, in the county of Herkimer, northerly to the forest, extending to the neighbourhood of the St. Lawrence. Its elevation is from 712 to 1100 feet above the ocean. On the southeast, between the river and the forest, the country slopes away from its base towards East Canada creek, while on the northwest it falls towards West Canada creek. The primitive rocks do not rise unbroken much, if any, short of ten miles from the river.

The Clinton range, called in Montgomery county Mayfield mountain, and Clip hill, does not reach the river without passing under the more recent rocks. Anthony's Nose, which is at the very termination, is partly primitive and partly transition. The former appears at the road for a few rods on either side of the point; the latter, which is sandstone, appears above and on the east side, for about three miles. On the east side the sandstone extends a mile or more, exhibiting a perpendicular front of nearly or quite two hundred feet. On the west side, the same rock has a precipitous front for upwards of a mile. Considerable ruins lie at the foot of the rock. The sandstone con-

tains some calcareous matter. The same rock forms the high bluff on the south side of the river. The stream flows over primitive rocks, which appear in the banks, &c. of the canal, at the Little Nose.

The primitive rocks of the Clinton range are often bare between Anthony's Nose and Black river road, which passes through the village of Johnstown. The latter road, and some others, which cross the range are on the naked rock. The easterly side is occasionally abrupt. The range, however, has only one declivity till after it has passed Black river road, in the direction of the forest. The Kayaderosseras and Palmertown ranges keep above the other rocks, without dipping, till they finally pass under them.

The primitive rocks on the north side of the Mohawk, and perhaps those on the south side of the same river, come very near the surface. On the former side, we know this to be the fact. In West Canada creek, nine miles from its mouth, they emerge in bare masses, not only in the bottom of the stream, but along its sides for a very short distance. The same rocks are to be seen in Timmerman's creek, in Manheim, two or three miles north of the river. East Canada creek flows over them a few miles above its mouth. In several other places the streams have uncovered them. As they approach the river they descend, and as they recede they rise. The configuration of the ranges, and even that of the country, indicates these facts. The transition and secondary rocks have been thinly superimposed. They follow all the inequalities of the surface of the fundamental rocks, and in certain cases exhibit surfaces not dissimilar to them. The same remarks, we are of opinion, may be applied to some other tracts bordering this primitive region. Primitive rocks form the core of the Highlands of Black river, and some of the spurs that shoot out from them.

The extreme length of the primitive district under consideration, from northeast to southwest, is not far from one hundred and fifteen miles, and its extreme breadth, in an opposite direction, about eighty-five miles. It contains the counties of Warren, Essex and Hamilton—the northerly parts of the counties of

Washington, Saratoga and Montgomery—the northerly part of the county of Herkimer, the northeasterly corner of the county of Oneida, the easterly half of the county of Lewis, or that part on the right side of Black river—the southeasterly half of the county of St. Lawrence—the southerly half of the county of Franklin, and about two-thirds of the county of Clinton. The Hudson, the Schroon, the Sacondaga, the two Canada creeks, Black, Oswegatchie, Grass, Racket, St. Regis, Chazy, Saranack, Sable, and Boquet rivers, have their sources in this district. The Hudson and Racket seem to rise in the most elevated parts of the district. On all sides there is a depression which is now easy, then rapid. Several chains of mountains traverse it. These chains are usually not very high, being based, as it were, on a very highly inclined plain, which rises nearly on all sides, and terminates in a kind of elongated centre, which overtops the whole. These chains, with their collaterals, the reader will remember, we have described under the appellation of the Sacondaga mountains.

Among the primitive rocks, granite seems to take precedence. This is the highest and lowest rock in place. It appears to underlay almost the whole district, and to hold all the other rocks of primeval formation in subordination. Gneiss, sienite, hornblende, trap, mica slate, clay slate, primitive limestone, &c. are recumbent on it, or one another. We shall go into some particulars in relation to these rocks, beginning with the granite.

Throughout the whole extent of the Palmertown and Kayaderosseras ranges of mountains, granite displays itself. In the former it rises to the tops of some of the highest peaks. It is also seen on its sides and at its base, in large bare masses. In the latter granite discovers itself very conspicuously at its base, on its declivities, and on its summit. The two ranges are from six to nine miles apart. Between the ranges, in the valley, granite appears in considerable ridges, supporting masses of siente, gneiss, &c. which run into each other, or into the granite.

The Clinton and Chateaugua ranges, &c. with their intervening valleys and ridges, exhibit granite in a very striking manner. In these ranges, as well as in the preceding, it is the

lowest and highest rock. All the others are seen upon it, either overlaying it, passing into it, overlaying one another, or passing from one into the other. Granite is seen in the former in the towns of Johnstown and Mayfield, in the county of Montgomery, and at various other places in the counties of Warren and Essex, lying more to the northeast. That found three miles westerly of the village of Johnstown, De Witt Clinton, the late Governor of New-York, calls graphic granite. Professor Nuttall, and others, concur with him in this opinion.

At Little Falls, in the county of Herkimer, granite is found although not abundantly ; the rock, at this place, being mostly gneiss. The latter, however, is generally incumbent on it. Granite, nevertheless, is abundant in the northern towns of this county and in the forest. The same rock appears between West Canada creek and Black river, and thence north northwesterly, along the right bank of the same river to Wilna, in the county of Jefferson. It often emerges in patches and small fields, exhibiting little else than desolation.

Between Lakes Champlain and George, and between the latter and Schroon river, the country is rocky and sterile. The space between those lakes is the most repulsive of any we ever saw. Little else than rocks are to be seen. The same rock is found to prevail in the county of Hamilton. It shows itself along the Sacondaga, Hudson, and other rivers, and in the mountains and intermediate at short distances. Granite is also found in the counties of St. Lawrence, Franklin and Clinton, both in the mountains and in the valleys.

Much of this district is too meagre for tillage. Around the head of Black river, and in many other parts, the earth is covered with moss, beneath which there is commonly a thin layer of sand, and then the rock. In Herkimer, Montgomery, Hamilton, Warren and Essex we have seen fields which had been cleared that were literally strewed with blocks of granite and gneiss ; and in others bare masses which were fixed.

The granite of this district which has come under our observation, is generally of a very coarse structure. Its colours are various, such as greyish, reddish, greenish, blackish, &c. The

strata are both oblique and vertical. At the lower end of the defile, at Little Falls, on the north side of the river, and in many other places the strata are rent from top to bottom and resemble ruins. Here the strata are of the vertical kind. In the Palmertown, and the other ranges, very good sections of the oblique may be seen. The strata of the latter kind pass into the vertical and *vice versa*. In some instances the stratification is tabular and in others columnar.

The granite of this district differs considerably in colour, constituents and character, but this is not peculiar: In all granitic countries differences are found to exist. The difference depends principally on the predominating ingredients; the quartz, the felspar and the mica. The quartz is usually grey, seldom milk white. The felspar is white, greyish, yellowish white, reddish, yellowish, greenish, flesh red, &c. The mica is grey, yellow, and blackish. In some varieties the quartz appears to be wanting, and in others the mica. Although felspar may in general be said to be the prevailing ingredient, it does not appear to be so abundant as it is in the granite of New England, and some other countries. The felspar has often a shining lustre, which in certain cases, is vitreous, and in others not. Sometimes it is without lustre. The latter may, it is said, be its original condition, or it may proceed from long exposure to the weather.

Graphic granite, as we have before remarked, occurs in the Clinton range, about three miles west of Johnstown, and various other places.

Imbedded Minerals—These are garnets, shorl, or tourmaline, sulphuret of molybdena, spodumen, iron ore, &c. some of the tourmalines are large and posses great beauty.

Opalescent felspar occurs in the county of Essex, in the granite boulders, &c. for an extent of twenty-five or thirty miles. The boulders are large and small, and commence on the south near the outlet of Lake George. Some of the specimens are very beautiful.

Lamellar felspar (Petuntze) occurs in many places. It is said to be felspar in its first stage of decomposition. It is found in masses.

Diallage and plumbago have been found at Lake George.—See *Professor A. Eaton's Geological Nomenclature for North America.*

Sienite—This rock is found in the county of Saratoga, between the Palmertown and Kayaderosseras mountains, and in various other places, resting upon the granite. See *Dr. Steel's Geological Survey, &c. of the county of Saratoga.*

The same rock is found in many other parts of the district not only reposing upon the granite but in beds, &c. According to geologists, sienite is a granitic rock, containing hornblende but little or no mica. Sienite, like other primitive rocks, presents considerable diversities.

Gneiss—This rock, which ranks next after granite, is more abundant than any other in the district. It occurs plentifully at Little Falls, Salisbury, Norway, New Brunswick, Jerseyfield, and various other places in the county of Herkimer. It is often found overlaying the granite, and alternating with it. This is observable at Little Falls, where the victorious river has laid these rocks bare to a great extent.

The rocks at the Little and Big Noses, in the county of Montgomery, on the Mohawk, are gneiss. The Big Nose, or Anthony's Nose, as it is commonly called, is the termination of the Clinton range. The same rock is to be seen in Johnstown and Mayfield, in the latter county, and in the counties of Warren and Essex, and between the latter range and the Chateaugua, of which Fall Hill is the termination. We have observed it in Euphrata, Stratford, Hope, Wells, and Lake Pleasant. The three latter towns are in the county of Hamilton.

Gneiss constitutes no inconsiderable portions of the Kayaderosseras and Palmertown ranges of mountains. Here, as well as elsewhere, it overlays and alternates with the granite. See *Dr. Steel's Geo. Survey*, &c.

Much of this rock is found between Lakes Champlain and George, and between the latter and Schroon river, in the counties of Washington, Essex and Warren. The same rock is seen in the counties of Clinton, Franklin, St. Lawrence, Lewis and Oneida. It occupies part of the country on the right bank

of Black river. At Remsen, Oneida county, it is seen in the vicinity of Black creek, a water of Black river.

The gneiss of this district exhibits several varieties, such as the slaty, abounding with micaceous matter—the common and the indistinct slaty. The first is the highest, and the last the lowest. The former is usually in thin horizontal layers, which are easily separated. The latter is in thick layers, disposed obliquely, and is scarcely distinguishable from granite. Some have even confounded it with granite. The common holds a rank between the former and the latter. The three varieties may be seen at the Noses, in the county of Montgomery, and at the Little Falls, in the county of Herkimer, to very good advantage.

The constituents of gneiss, like those of granite, are quartz, felspar and mica, with this difference, that it contains more mica and less felspar. It is very difficult to determine where gneiss begins, and granite ends. The indistinct slaty is the link which joins them. Its structure, constituents and colours, near the place of contact, are very closely allied to granite. Werner, Jameson, and some others have enumerated several kinds of gneiss.

"The first (according to those geologists) contains mica in small quantity—the scales of mica, although separated from each other, are arranged in parallel ranges, and the rock breaks in a direction conformable with it. It is the parallelism of the ranges of mica, which distinguishes this kind of gneiss from granite, because its slaty structure is very indistinct, and the quantity of felspar is very nearly the same as in granite. The quartz and mica, each form separate layers; those of the felspar are thicker, and such varieties, when broken apart, have a ribbon-like aspect. Sometimes the quartz, in place of being disposed in layers or plates in the felspar, is in small parallel rods or bars, and when the rock is cut perpendicular to their direction, it appears not unlike petrefied wood."

"The second is named common gneiss, and consists of small layers of lenticular plates, composed of grains of felspar and quartz, placed over each other, and separated by layers formed

of scales of mica. It is sometimes glandular, or contains balls of quartz, or of compounds of quartz, and felspar, or of mica. This variety has been confounded with conglomerate."

"The third is very slaty and very micaceous. The scales of mica, from their smallness, appear indistinct, and form continuous plates. The felspar and quartz are in very small grains, and are sometimes so enveloped in the mica that it is difficult to distinguish them. It is also sometimes glandular, and in some instances almost an aggregation of balls of mica."

The gneiss which passes into granite, according to the same geologists, belongs to the third kind above named, and that which passes into mica slate to the first. Such seems to be the principal kinds and the distinctions made by these authors. Those of the first and second are satisfactory, but that of the third is left in doubt. The distinction is vague—nothing short of the most intimate acquaintance with granite and gneiss can lead to the designation.

Some geologists, in order to prevent confusion, have classed the indistinct with granite. Among these we might enumerate Mr. Clinton, the late Governor of this State, Professor Nuttall, and several Europeans. Oftentimes where the indistinct is incumbent on the granite, the strata pursue all the inequalities of that rock—the stratification is saddle shaped, mantle shaped, or it has some other shape. The strata sometimes pass without change of direction from one mass of granite to another. In others, at the meeting, they alternate several times, showing beyond all doubt, that both are of cotemporaneous formation.

Imbedded Minerals—This rock contains garnets, shorl, or tourmalines, sulphuret of iron, crysoberril, quartz, &c. Some of the tourmalines are large, and very beautiful. Iron ore occurs in large quantities in various places, in beds and veins. It is sometimes very much blended with the rock. It is seldom found pure. Iron pyrites also occur. Beds and masses of mica, limestone, trap, porphyry, &c. are found in it. The mica, in some places, alternates several times with the gneiss.

Tourmaline is sometimes found massive in it.

Mica Slate—This rock is still less abundant than gneiss. It occurs in the county of Saratoga, and in various other parts of the district. The common, undulated, talcky and fine slaty, are found. The first is straight and thick slaty—the second is waved—the third is straight slaty—the fourth is fine slaty, and passes into clay slate.

"Mica slate, Dr. John H. Steel, in his Geological Survey of the county of Saratoga, observes, extends along the southern termination of the Palmertown range, and is to all appearance, the last of the primitive class in this direction. It forms a moderate dip to the south, looking up to the granite, and reposing on the gneiss. It is only discoverable for the distance of about a mile, when it is either obscured by the alluvions, or passes beneath the transition rocks. The strata are much curved."

Fragments of mica are often met with southwardly as far as the Mohawk. We have often seen them in the counties of Herkimer, Montgomery and Saratoga, in the transition and secondary tracts. Some of the fragments weigh tons.

Imbedded Minerals—These are garnets, shorl, emerald, foliated graphite, oxide of iron, &c. &c.

Tale—"This rock occurs about six miles north northeast of Saratoga Springs, at the foot of the Palmertown range. Here it passes into steatite." See *Dr. J. H. Steel's Geo. Survey*, &c.

Steatite—This rock appears on Indian river, in the county of St. Lawrence, along the foot of the Palmertown range, in the town of Moreau, Saratoga county, and in various other places, in and adjoining the district. It is of different colours, such as white, yellow, grey, black, &c. It is massive, and has a soapy and unctious feel. Ink stands, and other articles are fabricated from it. According to Dr. J. H. Steel, granular limestone covers some part of the steatite rock in Moreau. The steatite of the town of Canton, in the county of St. Lawrence, is very beautiful.

Granular Limestone—This rock has been found in the county of Saratoga, on and adjoining the steatite; and also in some other parts of the district.

That found in the county of Saratoga, Dr. Steel informs us in his Geological Survey, is of a coarse granular texture; and that in its colours, and some other properties, it resembles the Shaftsbury and Bennington marbles. It is easily worked, and when pure, takes a fine polish. The quality of the rock will improve when quarries are sufficiently opened.

Imbedded Minerals—Sulphuret of iron, sulphuret of molybdena, plumbago, coccolite, &c. have been found in that of Saratoga. See *Dr. Steel's Geo. Survey.*

Trap—This rock occurs at the Little Falls, on the Mohawk, and some other places. We are not acquainted with any other locality save that at the Little Falls. It occupies a fissure in the granite, and is a few rods below the lower lock. It crosses the canal, and is about eighteen inches in breadth. On the south side of the canal, the rocks rise perpendicularly ten or twelve feet. The vein is seen to this extent. It is not slaty. Its colour is greenish. Some have called it green-stone. Trap, whin and green-stone are synonimous terms. The granite at this place, is overlaid with gneiss. The trap was laid bare by blasting and removing large portions of the rock, in order to make a course for the canal.

Hornblende.

This rock holds a conspicuous station among the primitive rocks of this district. It occurs in the counties of Herkimer, Montgomery, Saratoga, &c. In Herkimer county it is seen at the Little Falls, Salisbury, &c. incumbent on the granite. That at the latter place is mostly covered with alluvions, and is about seven miles north of the Mohawk river. In Montgomery it has been noticed in Clip Hill, in the town of Johnstown. Professor A. Eaton, in his Geological Nomenclature, distinguishes that of Clip Hill as belonging to the sienitic variety. In the town of Edinburgh, Saratoga county, Dr. Steel in his Geological Survey, &c. remarks, that it is found on the southeast side of the mountain, near the Fish-house on Sacondaga river, inclining against the granite. The stratum at this

place, has considerable extent. The slaty prophyritic, sienitic, &c. are seen in the same stratum.

Hornblende is also found in the more northern counties, such as Hamilton, Warren, Essex, &c. exhibiting most or all of its varieties.

Boulders of hornblende are strewed over the country southerly of the district, as far as the hills on the south side of the Mohawk. Occasionally they are large. In Broadalbin, in the county of Montgomery, we have seen some blocks of the latter description. They are all out of *situ*, having been transported from their original positions by torrents of water.

The hornblende of this district, is of various colours. Some is nearly black.

The hornblende in the vicinity of Lake George, contains augite. See *Professor A. Eaton's Geological Nomenclature for North America, published in* 1828.

The second primitive district.

This district is situated mostly in the southeasterly part of the State. It comprehends the counties of New-York, Westchester and Putnam, the greater part of Dutchess, and portions of Columbia, Rensellaer and Washington, extending along the confines of New England; the southeasterly corner of the county of Ulster, nearly one half of the county of Orange, most of the county of Rockland, Manhattan and Staten Islands, and the northerly parts of King's, Queen's and Suffolk, on Long Island. This district, on the east, is joined to the primitive tracts of New England. The latter is mostly a primitive country. The State of New-York, it is imagined, is nearly equally divided between the three great formations, such as the primitive transition, and secondary. As yet it is not known which is the most considerable in extent, but this is not of much consequence. We shall commence with the granite, as we have done in the northern district, on account of its being the most abundant rock in place, and because it holds the empire; all the other rocks being subordinate to it. In place it is the

lowest and highest among the primitive rocks. And as in the north, all the other rocks lie on it, or the one on the other, the granite forming the floor of the country. The skeletons of the mountains and hills, generally speaking, consist of it. We shall enter into some few details.

According to the accounts given to us by Dr. S. L. Mitchell, in his Geological Survey of this part of the State, granite occupies most of the southern parts of the State from the north side of the Highlands, or Matteawan mountains, including all on the east and part on the west side of the Hudson to its mouth. Manhattan Island, Staten Island and the northerly half of Long Island, he includes in the same district.

The granitic rocks, this judicious observer remarks, display themselves from the confines of Connecticut, along the Sound, which separates Long Island from the main, to Harlem river. They are also found on the east side of the Hudson, from its mouth to near the Matteawan mountains, and thence on both sides of that river, northerly, to the transition formation which begins a little north of those mountains.

Granite pervades and appears to underlay the counties of Westchester and Putnam, the southern, southeastern and eastern parts of the county of Dutchess, and the eastern part of Columbia. The Highlands, or Matteawan mountains, which cross the Hudson diagonally at and below West Point, are mostly composed of the same rock. So is the Taghconnick mountain, which ranges southerly, and which is partly in New-York, and partly in New England. This mountain, near the northwesterly corner of the State of Connecticut, separates into two branches. One of these proceeds southerly, and ends near King's Bridge, on Harlem river, which lies between Manhattan Island, and the county of Westchester. This branch traverses the eastern parts of Dutchess, Putnam and Westchester counties. The streams that rise on its eastern declivity, take such directions as to reach Long Island Sound, while those that rise on its western, pass into the Hudson. The other branch winds away southwesterly to the Hudson, constituting part of the Highlands.

Granite underlays the southeasterly corner of the county of Ulster, the easterly and southeasterly parts of Orange, and the northerly part of the county of Rockland. The same rock underlays Manhattan Island, Staten Island, and Long Island. In the two first, it is seen along their shores, and in the hills, &c. in bare masses. The hills on Long Island, called the Spine, stretching from Riverhead, westwardly, to the Narrows, a distance of sixty miles, consist of granite. This rock displays itself along the coast of the Sound, Hell-gate, or Hurl-gate, and East river, at short intervals. At Hell-gate, which connects the Sound and East river, it rises in unbroken masses which are generally abrupt, and forms the shores of the strait. The small islands in East river are also granite. The sands and loams of Governor's Island are spread over this rock, otherwise the island would have been washed away long ago.

The Matteawan and Taghconnick mountains, Dr. Mitchell remarks, are stratified. The strata have directions conformable with the ranges of those mountains, which are mostly from northeast to southwest. The strata are commonly vertical; sometimes, however, they have a declination towards the horizon. In addition, we would observe, that the strata on Manhattan, Staten and Long Islands, so far as they have come under our notice, seem to have nearly the same positions which those have in the northern district. We have seen the vertical, oblique, &c. The strata of rocks are viewed to the best advantage in mountain ranges.

The granite of this district, is chiefly composed of quartz, felspar and mica, which are the constituents of this rock. The mica here, as well as elsewhere, is occasionally wanting. The quartz is milk white, greyish, reddish, &c. It is also transparent. The felspar is white, red, flesh coloured, &c. The shades of these colours are diversified. The mica is grey, green, yellow, brown, blackish, &c.

The strata of the Matteawan and Taghconnick mountains are interrupted by numerous cracks and fissures. Some are longitudinal and latitudinal, while others are in the direction of the streaks and veins, or wind through the rocks in serpentine

courses. The width of the cracks and fissures, Dr. Mitchell says, is from a line to three feet, and even a rod or upwards. They are chiefly filled with quartz, felspar and glimmer; sometimes separated and sometimes blended together, while at other times the quartz, felspar and glimmer, are cemented together in large coarse masses, and rolled. Such appears to be the general structure and disposition of the granitic rocks along the borders of Long Island Sound, East River and the Hudson, creeks, hills and mountain sides and tops, and generally wherever they emerge from beneath the soil.

Accidental mixed parts—These are glimmer, shorl, &c. The glimmer is sometimes brown, or of a darkish hue, and at other times colourless. The shorl is black, green, &c.: it is both rough and crystallized—it is an imbedded mineral.—The shorls or tourmalines are often very large, and highly beautiful. The garnets are of a reddish colour, and friable texture. They fill up cavities in some places in the rocks. "Magnesian minerals are of frequent occurrence on Manhattan and Staten Islands. On the former island, apatite has been found in small masses."—Dr. *Mitchell.*

Gneiss—In many places throughout the district, this rock is found overlaying the granite. In some cases it forms hills, and in others constitutes no inconsiderable proportion of some of the mountain ranges. It is quite abundant in some of the Highland ranges of mountains. The same kinds occur which we have mentioned as occurring in the northern district, *to wit*, the slaty common and indistinct slaty.

Imbedded Minerals—These are tourmalines, garnets, iron ore, beryl, chalcedony, &c. The tourmalines and garnets are of common occurence. Iron ore is not unfrequent. The beryl, Dr. Mitchell informs us, was found at Sing Sing, in the county of Westchester, and the chalcedony about New-York.

Hornblende—This rock is met with in several places Professor A. Eaton gives us to understand, that it constitutes most or all of Butter Hill, at the Highlands. He speaks of the slaty, granitic, and gneisseoid varieties. Hornblende is found at sev-

eral other places in the same mountains. After gneiss it is considered the most abundant rock.

Sienite—This rock, although occasionally found, does not appear to hold a very conspicuous station in the district.

Mica—Mica occurs in many places in this district. We have seen it in place on Manhattan and Long Islands, overlaying the granite. Some is straight and thick slaty. This is what is called common mica. Some is undulated—some is straight slaty, and others fine slaty. Its colours are greyish, yellowish, blackish, &c. The grey we have noticed in plates an inch or more square. The specimens were exactly like the Muscovy glass, used for windows, lanthorns, &c. The plates are easily divisible, and are very thin. Dr. Mitchell says, that mica occurs on New-York island, in six sided plates, evidently of a crystallized figure. Mica is found in the Highlands.

Mica is not a very abundant rock in the State. We shall close this article with an account of some localities in the western country. This, although not in order, may nevertheless be acceptible.

Mica slate, according to Mr. Thomas, one of the canal engineers, is found in several places in the county of Chatauque, and in the Pennsylvania triangle. We shall state the substance of several passages in his travels.

Twelve miles south of Cattaraugus creek, in the county of Chatauque, and one mile southeast of the road on the beach, mica slate occurs. It is primitive. The Chatauque ridge is distant two or three miles. Here the Canada-way, a small torrent, has denuded it.

About five miles southwest of Fredonia, on Canada-way, the streams have laid bare the mica slate rock, which is but a few feet beneath the surface. Many fragments are scattered over the surface. These exhibit the curvilineal form.

Mica slate, it is highly probable, is the basis rock of the Chatauque ridge, in this quarter.

Mica slate appears in Twenty Mile creek, forming its banks. The banks exceed fifty feet in perpendicular elevation. The

soil hereabouts is composed of the ruins of rocks of this description.

Mica slate occurs in the vicinity of Erie-town, in Pennsylvania, where the waves, some years ago, broke through the peninsula. Here it has a fine argentine appearance, exhibiting the curvilineal appearance or form. It is qarried for building stone.

Steatite—This rock has not, as yet, as far as we can learn, been discovered in place, in the district; but there can be no doubt of its holding a station; since, according to Dr. Mitchell, it has been found in the alluvial soil of the city of New-York, and its environs, in loose masses; and also on Staten Island, near the Health establishment.

Actinolite is found in Manhattan Island, in very beautiful green crystals, from one to two inches long, through rocks of indurated steatite.—Dr. *Mitchell.*

Limestone—Primitive limestone, or granular limestone, occurs in the county of Westchester. The formation extends from the town of Sunderland, or even farther, in the State of Vermont, through the western part of Massachusetts, almost to the city of New-York. A portion of this formation penetrates into the county of Rensellaer. Professor A. Eaton calls that of the latter county transition: and Dr. Mitchell, and some others, primitive. The quarries of statuary marble at Sunderland, Arlington, Shaftsbury and Bennington, in Vermont; and those at Lenox, Stockbridge, &c. in Berkshire, in Massachusetts, are embraced in it. In many places it alternates with mica, slate and gneiss. It is stratified, and has a granular structure. Its usual colour is snow white—sometimes it is clouded, and at others striped, dotted and spotted. It takes a good polish. In some instances the polish which it takes is exquisite.

The marble of Sing Sing, and of West Farms, in the county of Westchester, is but little inferior to the preceding: perhaps when the quarries are extensively wrought, and the marble brought into repute, it will be found nowise inferior to that of the best quarries in Massachusetts and Vermont. The marble from the county of Westchester, which we have seen, is white.

"The island of New-York, near King's Bridge, affords a compact marble, which is employed in architecture. It is white and granular, and contains considerable quartz. In some places it is penetrated by brilliant pyrites. The grains, in some spots, are as large as the particles of coarse salt. They fall asunder spontaneously, or with the gentlest motion."—Dr. *Mitchell.*

The following is copied from Professor Eaton's Geological Nomenclature for North America:—

Granular limestone—Divisions—"It is compact at Stockbridge, Massachusetts, sandy on the west side of Pittsfield, in the same State, on the Albany stage road. *Varieties*—Statuary marble, Stockbridge, Massachusetts. Dolomite, Barrington and Sheffield, Massachusetts, and Milford, Connecticut. *Contents*—Tremolite, Canaan, Connecticut. Serpentine and chromite of iron, Milford, Connecticut.

Serpentine—"Some of the huge rocks of stellated asbestus, in the city of New-York, run into serpentine. Specimens yield to the saw, and can be made into slabs like marble. It is greenish and variegated, with whitish clouds. Detached pieces of serpertine have been found scattered through the alluvial basis of the city of New-York. Some of them are beautifully coloured. The colours vary from deep green to cream coloured, and whitish. Some present the appearance of vegetable forms in painting, and are in reality a kind of landscape stone. Dr. *Mitchell.*

The promontory of Hoboken, in New-Jersey, consist chiefly of serpentine, in a massive form. It is cracked through in all directions with viens and fissures. Dr. *Mitchell.*

The veins contain native magnesia; also silex and iron. Dr. Bruce has described the former in his American Meteorological Journal, thus; "colour white, passing into greenish white; lustre pearly; structure foliated; the folia or leaves frequently having a radiated position: the leaves, when separated, are transparent: in the mass they are translucent. The veins vary in breadth from a few lines to two inches.

The more ancient serpentine is ranked among primitive rocks:

the more recent among transition. It often encloses steatite, talc, asbestus, mica, chlorite, garnet, magnetic iron ore, &c.

Asbestus, with rigid fibres, is often found in the city of New-York, in detached masses: it is mistaken by many for petrified wood. It is also found at Hoboken, in New-Jersey, where it fills the veins of serpentine. It is likewise found on Staten Island, where it accompanies steatite.

The forms of asbestus, called thrum stone, leather stone, mineral cotton, and Salamandar's wool, are all contained in the primitive formation of New-York, and its vicinity.

Amianthus occurs in the mountains along the confines of New-York and Connecticut, at Staten Island, &c. The varieties are numerous—the fibres are sometimes ten or twelve inches long, and by their whiteness, parallelism and flexibility, resemble flax. At Staten Island, fibres have been found which were nearly two feet long, and which twisted like hemp—Dr. *Mitchell.*

Amianthus was fabricated by the ancients into cloth, which, being incombustible, they wrapped up the bodies of their dead in it, before they were placed on the funeral pile, in order that their ashes might be gathered without admixture.

Actinolite is found in the stellated asbestus, in beautiful green crystals, from one to two inches long—Dr. *Mitchell.*

Palisadoes—On the west side of the Hudson, below the Highlands, or Matteawan mountains, there is a range of rocks of secondary formation, called by this name. Red sandstone underlays these rocks, as may be observed along their base on the margin of the stream, where it is not covered with ruins. Dr. Mitchell, in his Geological Survey, in addition to the sandstone rock, remarks, that indurated clay underlays some portion of the range. The range is about thirty-eight miles in length, and from one to two in breadth. These rocks are trap or greenstone. See *Dr. Ackerly's Geology of the Hudson.* Dr. Mitchell, in his survey, considers them basalt, and is of opinion that they were formed by subterraneous fires. The sandstone supporting them, exhibiting no symptoms of derangement in its strata, induces us to adopt the opinion of Dr. Ack-

ley, and some others, that their origin is attributable to water, not to internal fires. The sandstone beneath them is in horizontal layers, and appears at the water's edge, and some higher.

The palisadoes approach the Hudson, from the northwest at Haverstraw bay, in the county of Rockland, and then turning, take a southerly direction, running sometimes near the river, and at other times at a small distance, till they arrive at Tappan bay, where they advance along the stream for many miles, forming a very high wall, with an almost perpendicular front.

These rocks are disposed in vertical strata, with perpendicular fissures, which separate them from top to bottom, giving them a very extraordinary appearance. The front of the range, along the Hudson, is bare about midway, and appears to very great advantage from the stream. The lower part of the front is concealed by an immense debris which has been formed by the breaking down of the rocks. The rocks composing this range, descend very gently in their progress southwardly. The palisadoes are partly in the county of Rockland, and partly in New-Jersey. Bergen Point, north of Staten Island, it is said, is their termination. This range of rocks, from its front, exhibiting an appearance like the trunks of trees, set side by side, has not been inaptly named.

Like the Giant's Causeway, in Ireland, the columns composing the palisadoes are severally in short pieces, which are so shaped that the one fits and is adapted to the other.

Nyack Hills—The Nyack Hills, in the county of Rockland, are, properly speaking, a continuation of the palisado range. They are mostly composed of red sandstone, and at first occupy the country along the Hudson ; then a little back, and afterwards along the margin of the stream, or in other words, they commence on the western bank of the river, then diverge, and lastly return. Between these hills and the Hudson, there is a champaign tract. The Nyack Hills are considered by geologists, to be of secondary formation. The sandstone of these hills is a durable and excellent building-stone. The layers are thick, and are disposed in a line with the horizon, or nearly so.

At Nyack, thirty miles north of the city of New-York, the

sandstone strata overlay the bones of land animals—Dr. *Mitchell.*

The same distinguished naturalist, remarks, that the bones disinterred at Nyack Hills were in a stratum of loam, underlaying a mass of red sandstone, eight feet thick, upon which was superimposed a cover of arable soil, four feet deep.

These hills, it would seem, were formed anterior to the palisadoes, and are to be deemed of cotemporaneous formation with the red sandstone supporting those rocks.

Geological structure of Long Island resumed.

This island, as we have before remarked, is divided into primitive and alluvial. On the north a ridge of hills extends from the west end of the island, as far east as River Head, a distance of sixty miles. That part lying north of the hills, and facing the sound, is diversified with some rises and eminences; while that part situated on the south, is a plain with a very moderate descent, southwardly to the ocean. The eastern part of the island, or that beyond River Head, is also mostly a plain. Granite, it is supposed, constitutes the base of the whole island, and supports the soils, whether sand, sandy loam, clay or gravel. The hills constituting the spine, are chiefly granite; so are the rocks which appear along East River, Hell-gate or Hurl-gate, and the Sound.

The plain, or alluvial tract, which contains two-thirds or more of the island, is composed mostly of sand and sandy loams, which repose on the granite. Some have supposed that these sands and loams have been brought by the Gulf stream, and spread over the primitive rocks. This supposition seems not to be well founded. The transportation of the sands and loams, composing the plains, must have been by an agent possessing much more power than the Gulf Stream.

Along the south side of the island, there is a flat from one to two miles broad. This flat ends at the ocean, by passing under its waters. From thence the descent continues southerly and southeasterly to the Gulf Stream, where it terminates a-

bruptly. In that stream no soundings are to be obtained, without a very long line. The declivity, all the way from the termination of the flat, to the Gulf Stream, which is from forty to sixty miles, is very gradual, being about four hundred and eighty feet, which, on an average, is from eight to twelve feet to the mile. The eastern part of this flat is sand and sandy loams; the middle and western parts are formed of sand, loams and stones. The south side of the island is inaccessible to ships owing to flats, shoals and bars.

Long Island, it is believed, was once a part of the continent, but was separated from it by the waters of the Sound breaking through at the narrow strait, called Hell-gate, and making their way thence southwesterly to New-York bay. The Indians, who formerly lived in the vicinity of this strait, had a tradition that there had been a time when their ancestors walked over this strait without wetting their feet, by stepping from rock to rock.

Primitive Clay Slate.

This rock occupies a narrow strip along the eastern margin of the counties of Rensellaer, Washington, Columbia, &c. Williamstown mountain is mostly clay slate. This range stretches on the one hand through the State of Vermont, and on the other through the States of Massachusetts and New-York, into New-Jersey. Its laminæ, in some places, stand at angles of from fifty to sixty degrees, and at others approach the horizon. The laminæ are straight, undulated, &c.

Several quarries in the counties of Rensellaer, Columbia and Dutchess, have been wrought for roof slate, but as the people of the city of New-York have imbibed a taste for Welch, and other foreign slate, these quarries have not been opened to any extent. The clay slate of this range, displays various colours, such as slate colour, green, blue, purple, bluish purple, deep red, brick red, varigated, &c. Veins of milk-white quartz traverse it.

Chlorite of a beautiful green, manganese, sulphuret of lead, iron pyrites, red and striped jaspar, have been found in it.

See *Eaton's Survey, Silliman's Journal of Science, and Davy's remarks.*

CLASS II.

Slate—Clay slate, or slate of different kinds, going under that denomination, occupies large portions of the State. In treating of rocks of this kind, we shall be under a necessity of making certain distinctions, which have not hitherto in general been made. The slate of the Hudson and its vicinity, differs from that of the interior, while the latter varies from that of the west. On the Hudson the layers are either vertical or oblique. In the interior they are horizontal or approximating to that position. In the west the layers have dispositions with the horizon, but the character of the rock differs from the slate rocks of the interior and the Hudson. The difference in the three cases is very marked. Each variety has something marked—something distinct.

We shall endeavour to give the outlines of the formation. These in the main will be found correct: Although accuracy in every particular may be desirable, yet in the infant state of geology among us, it cannot be expected. Again, the improvements are too recent, and not sufficiently extensive. Only about one-fourth of the superfices of the State, or very little over, is cleared and cultivated, as will hereafter be seen in our statistical view.

Setting out a little north of the Highlands, or Matteawan mountains, on the Hudson, we find that the slate commences where the granite and other rocks of primeval formation terminate on that side, and extends northwardly on both sides of that river, to, or very near the head of Lake Champlain, where it passes under the limestone formation in that quarter, which we intend noticing hereafter. It however, re-appears, after it has passed under the latter rock, which is incumbent, and pervades the narrow strip from the head of South bay on the latter lake, southerly to Wilton, in the county of Saratoga, and westerly to the foot of the Palmertown range, of the Sacondaga mountains. On the east it runs back to the mountains, pervading most of the counties of Washington, Rensellaer, Columbia

and Dutchess, or such parts as are not embraced in the primitive tract which we have last described. On the west side of Hudson's river it runs back to the Kaatskill, and other mountains, and thence westwardly to lakes Ontario and Erie, although not without some interruptions, as we shall show in the course of this chapter.

Slate may be said to underlay parts of the counties of Ulster and Orange; all of the counties of Green, Albany, Schoharie and Schenectady; the southerly parts of the counties of Saratoga, Montgomery and Herkimer; the greater part of the county of Oneida; the southwesterlry part of the county of Lewis; the northeasterly half of Oswego. The counties of Sullivan, Delaware, Otsego, Broome, Chenango, Tioga, Courtland, Tompkins, Yates, Steuben, Alleghany, Chattaraugus and Chatauque, are wholly, or in part, underlaid by it. So are the southerly parts, of Madison, Onondaga, Cayuga, Seneca, Ontario, Livingston, Genesee and Erie. Its bounds on the south and east are the primitive district secondly described, and those of the State, while westwardly and northwestwardly, it is terminated by lakes Erie and Ontario, and northwardly by the primitive district firstly described.

Slate, in general, is the fundamental rock in this district. The sandstone, limestone, and other rocks of newer formation, are incumbent on it or one another. Almost every where the slate may be seen passing under and emerging from beneath the latter rocks. This is observable in the first and second great limestone tracts, and in other tracts more limited. On the borders, however, of Lake Ontario, in certain places, the slate dips and disappears so that we only see the limestone and sandstone rocks.

Slate, in general, forms the banks of the Hudson, between the Highlands and Sandy Hill, a distance of one hundred and twenty-five miles. It often, within these limits, rises in masses, and forms ledges, cliffs, &c. while in others, it is covered with soil only appearing where excavations are made, as in the cases of wells and cellars, although not always in these. It forms the beds and banks of most of the streams that fall into the Hudson,

within the space specified. The bed and banks of the Mohawk are slate, nearly as high as the city of Schenectady. In the vicinity of this place, it passes mostly under the alluvions, appearing, however, occasionally in the hills. Following the Mohawk upwardly, slate re-appears in Flint Hill. The base of this hill is slate. From this hill, westwardly, slate occurs in various places, to Fall Hill. Indeed, it may be said to form most of the bed of the river thus far, the sandstone and primitive rocks scarcely making exceptions. The same rock may be traced from the west side of Fall Hill to Utica, Rome, and to the source of the river ; also in Fish creek, Salmon river, and northwestwardly, in that direction, to Lake Ontario.

The Schoharie, which has its rise in the Kaatskill mountains, is, in general, underlaid with slate. The beds and banks of the Cayadutta, Canajoharie, Osquake, Fulmer and Staring's creeks, are mostly slate. The same rock shows itself in Caroga creek, and the two Canada creeks, at and near their mouths. In the Schoharie it may be found for at least twenty miles above its mouth, without interruption. In the Cayadutta, about four miles. In the Caroga, for several miles, soon after leaving the river valley. In the Canajoharie, with very few exceptions, upwardly to the Osquake hill. In the Osquake, to the mills of Mr. Van Horne, ten or twelve miles. In East Canada, up to the falls, a mile. It is only in the bed till we come near the foot of the falls where the rock is limestone. In West Canada creek, it is found about four miles, where it is interrupted by a kind of calcareous sandstone, then by granite, and afterwards by the same sandstone. Slate, notwithstanding these interruptions, is abundant in Hassencleaver mountain, a little back from the stream. On the south side of the Mohawk, slate is found, southwardly to the sandstone, which supports the limestone formation, running westwardly from Coeyman's, in the county of Albany, to the Niagara river. The shores of Ballston, Saratoga, and Round lakes, where not covered with soil, are slate. The bed of Fish creek, that falls into Oneida lake, those of Little and Big Salmon rivers, and that of Little Sandy creek, are slate. Hassencleaver mountain, which is in the counties of

Herkimer and Oneida, is mostly slate—also those parts of the Highlands of Black river, which are westwardly and southwestwardly of the limestone formation, extending from the Mohawk, through the country to the St. Lawrence, and Lake Ontario.

The Kaatskill mountains have slate for their base. The same rock forms the bases of many of their collaterals. Slate surrounds about two-thirds of Otsego lake. The bottoms of the Susquehannah, Unadilla and Chenango rivers are usually slate. Owasco lake is environed by slaty banks. Cayuga lake, from its head northwardly, to the limestone formation, is enclosed with slate. Fall creek, that empties into it, runs over a slaty bottom. The shores of Seneca lake are slate. The central limestone formation crosses the northerly part of Cayuga lake, and by the head of Seneca. The shores of Crooked, Canandaigua, Hemlock, Honeyoe and Canesus lakes are also slate. Slate constitutes the bed of Genesee river, from Mount Morris up to Nunda, &c. The stream, for ten miles, flows through a rocky ravine of slate. It forms a floor for Allen's creek, above the central limestone formation. Eighteen Mile and Cattaraugus creeks, which fall into Lake Erie, have beds of slate. The shores of Lake Erie hereabouts are also slate.

The extent of the formation, computing from the interior of the county of Rensellaer to Lake Ontario, at the mouth of Big Salmon river, in the county of Oswego, is rather over one hundred and fifty miles, and in a northwesterly direction. Westwardly of Little Falls, this portion of the formation spreads. Its extent, from Stephentown, in the county of Rensellaer, westwardly to Lake Erie, surpasses two hundred and eighty miles.

The slaty districts often present very beautiful scenery. Those along the Hudson, and that south of the limestone ledge, between Linklaen's lake and Genesee river, afford good examples.

We have already remarked that the slate formation exhibits several kinds. We shall enumerate and notice those which are the most considerable. These are :—First, transition clay slate: Second, grey wacke slate: Third, secondary slate:

Fourth, bituminous slate: And fifth, allum slate. The three latter belong to the third class of rocks, or such as are secondary.

Transition Slate—This rock occupies the country on both sides of the Hudson, from near the Highlands, northwardly almost to the head of Lake Champlain. It passes on the east and west under the grey wacke slate. The clay slate along the Hudson is either vertical or much inclined. At Gibbons'-ville, Troy, and many other places on the margin of the river, it is often perfectly vertical. The layers are thin waved and contorted. They are glazed and very fragile. The latter is usually called glazed slate. A little above Gibbons'-ville, it is seen in the islands at the mouth of the Mohawk, and thence up the latter river to the Cohoes Falls, holding intermediate positions between the perpendicular and horizontal. The shores of the islands, and the banks of the river, are usually precipitous. The rise of the banks, from the mouth of the Mohawk to the head of the Cohoes, is from one hundred to one hundred and thirty feet. The dip at the falls is towards the Hudson. The layers have angles of between sixty and seventy degrees. These falls are not perpendicular, the declivity corresponding with the dip and lean of the rocky layers. The descent of the falls is seventy-eight feet. The islands, banks and falls exhibit fine sections for observation.

On ascending the Mohawk above the Cohoes, its banks diminish in height. This apparent diminution is occasioned by the elevation of the bed of the stream since the country rises.

The clay slate below Schenectady runs under the grey wacke slate. The layers, where it passes under, approach very near the horizontal position.

The clay slate, soon after ascending the Cohoes Falls, is covered with grey wacke slate. The bed, thence upwardly to within two or three miles of Schenectady, consists of the latter rock. Here it passes under the alluvions. It is, however, seen in the hill near Union College. The banks and hills are wacke slate. Sometimes it appears on both sides, and sometimes only on one side; now rising abruptly, then shelving towards the stream;

now bare, then covered. Seven or eight miles east of Schenectady, on the Saratoga side, there is a very interesting locality, extending some distance along the canal, and in full view of the river. Its front rises very abruptly from ten to sixty feet. The ayers range from five to ninety degrees; some lean west northwest, some east southeast, some stand perpendicular, while others are bent and rest upon those rising nearly perpendicularly. The middle layers approach, and in some instances, attain vertical positions.

A little west of the latter, there is another locality which is nearly as interesting. It is on the margin of the canal, and as well as the preceding, has been laid bare by opening the canal. At its commencement the layers stand at an angle of seventy-five or eighty degrees; as we proceed westwardly, they decline to thirty or thirty-five, when they are succeeded by layers very nearly horizontal. These, at the line of meeting, rest upon the last layer of the foregoing. The layers have great regularity. At the meeting, the last of the highly inclined layers sustains the ends of all the upright. This layer is straight, and has an angle of thirty degrees from the horizon. The layers of both have considerable thickness. The rock is blackish and soft, and disintegrates rapidly. Above the horizontal layers, there is coarse grey wacke, of a hard sandy texture, disposed in very thick layers, with vertical rents. This rock resists the weather. The latter seems to cap the former, as far up as the upper aqueduct, or farther.

On crossing over the river by the upper aqueduct, we noticed a locality of wacke slate, lying in horizontal layers, from a foot to sixteen inches thick, separated by very delicate seams, so as to give the whole the appearance of a work of art. The rock here is also blackish and soft, and yields to the weather.

A few miles west of Schoharie creek, in Montgomery county, on the south side of the canal, there is a short range of grey wacke slate, which rises at an angle of about fifteen degrees.

There are some small tracts of secondary formation in the transition district. Three or more have been observed in the county of Rensellaer. One is in the town of Schaghticoke;

one in Greenbush, and one in Tomhanic. These are compact limestone, and rest on grey wacke.

The old red sandstone of Werner occurs in the same county in several small fields. It is mostly in the towns of Nassau, Grafton and Sandlake. It resembles the red sandstone of Kaatskill mountains. Marine relicts, such as coralines, &c. have been found in it, but as yet no land organic remains.—*Eaton.*

Grit sandstone also frequently occurs in the same county, but in limited patches.

The bed and banks of the Hudson, from Waterford northwardly, present many sections for observation. In the county of Saratoga, the layers in the vicinity of the river, and in some other places, are considerably inclined; but some miles back, they lie nearly in a line with the horizon. They are both straight and curved.

In the counties of Washington, Rensellaer, Columbia and Dutchess the clay slate, often in its layers, forms angles between forty and seventy-five degrees. The angles are less in the plains than in the hills. Towards the primitive mountains of New England, the laminæ, however, become more horizontal.

The county of Albany is mostly underlaid by clay slate. Along the Hudson its layers are ordinarily very much inclined. Upon leaving the river hills, they soon assume the horizontal position. In the counties of Greene, Ulster and Orange, slate is in general found as far back as the mountains. On the border of the river, the laminæ have commonly great declinations, elsewhere they vary and pass to the horizontal.

The inclination of the layers of clay slate towards the horizon, does not always depend on elevation.

Clay slate varies considerably in colour—it is greyish, brownish, blackish, greenish, &c. In the Mohawk country it is blackish; also in the bed of Salmon river, &c. There is in general a great sameness. The finest is in the lowest situations, and the coarser in the higher. By lowest, we do not mean the Mohawk valley, or any other valley in particular, but deep cuts or sections laid bare by streams. Slate equally fine with that

found in the bottom of the Hudson and Mohawk valleys, may be found miles from them, and hundreds of feet higher. The whole seems to have been formed during the same period, and to have been precipitated or deposited on the primitive rocks. The precipitator was water in a state of repose, or nearly so. The layers in the Mohawk country, and other tracts of country, embraced in the formation, although said to be horizontal, are not exactly so. They do not range towards the west and northwest generally, as some have alleged. The ranges or dips are conformable to the surfaces of the fundamental rocks which support the formation. In all the valleys we behold this order. The lean is from, and the dip towards, the valley. The surfaces of the fundamental rocks, then it is very likely, have slopes in some respects conforming with those of the slate. The slate of the Mohawk country, and thence to Lake Ontario, is called by some grey wacke.

Slate suitable for covering houses, is found at Hosack, Troy, Rhinebeck, and other places on the east side of the Hudson. It has not, however, been wrought to any considerable extent, owing to a preference given to transatlantic slate. A preference founded in a great measure on caprice. We import roof slate, limestone, marble, granite and coal, although our country has all of them in abundance, and in as good perfection as those imported.

The clay slate is often traversed by veins of milk white quartz. Chlorite, of a beautiful green colour, is frequently attached to the quartz, and imparts its colouring matter.

The slate in the county of Albany, &c. in certain localities, abounds with very perfect crystals of quartz. One of these localities is at Crystal Hill, a little to the south of the city of Albany.

Glazed slate occurs in the counties of Washington, Rensellaer, Columbia, Dutchess, Ulster, Green, Albany and Saratoga, above the transition clay slate. Its colours are grass green, bottle green, &c. On blasting, the rock separates into innumerable lenticular pieces. Some of these are of a jet black colour, and glazed on all sides. Their surfaces are spangled

with extremely minute cubical crystals, of iron pyrites, of a brilliant golden lustre. Some of the glazed slate is covered with the carburet of iron. In some instances it has vey much the appearance of shale.

Jasper slate, or green flinty slate, occurs at Crystal Hill, in the county of Albany, and in other places, in alternate layers, with the transition slate. It resembles silicious slate in its texture and fracture. Its colour is a beautiful grass green. It takes a fine polish. Iron pyrites and calc spar, are now and then found in it.

Silicious slate, or indurated slate, also occurs in alternating layers, or in beds near the banks of the Hudson, and its streams, throughout the counties of Saratoga, Albany, Greene, Columbia, Rensellaer and Washington. It differs very widely from transition slate. Its occurrence is usually in beds between the layers. Its colour is generally a dark blue or brown, sometimes it is black. It has a flinty appearance, and readily breaks into rhombs, cubes, &c.

Allum slate occurs at Troy, New Lebanon, and various other places in the district under consideration. Its colours are greyish, bluish, brownish, iron black, &c. It is slaty in its structure, soft and brittle, and has a meagre feel. When exposed to the weather it falls into pieces. In the latter condition it is covered by an efflorescence.

Allum slate also occurs in the Mohawk and western countries.

Slate clay, or shale, likewise occurs in this district, but not very abundantly. Its colours are grey, bluish, yellowish, blackish, &c. Grey is its ordinary colour. It is massive, and is readily known by its slaty structure in one direction, and is earthy, in the other. Shale usually accompanies coal, but it is a different kind from that in the valley of the Hudson.

Transition Grey Wacke Slate, or First Grey Wacke—This rock is very nearly allied to the clay slate along the Hudson, &c. It would perhaps be difficult to say precisely where the one ends and the other begins. On the one hand it descends into clay slate, and on the other ascends into sandstone, rubblestone, &c. The passage on both hands is very gradu-

al. This rock is commonly called slate. The distinction usually made by geologists, it would seem, is rather artificial than otherwise. Grey wacke slate occurs in all the counties on the Hudson, between the Highlands and the head of Lake Champlain. It is incumbent on the transition clay slate before spoken of. It also occurs in the Mohawk country, and northwestwardly to Lake Ontario. On the south side of the great central formation, it extends westwardly to the confines of the counties of Onondaga, Courtland, &c. where it is believed to pass in a south southwesterly course into Pennsylvania. It underlays pretty generally the country situated southwardly of the great central limestone formation, as far as Pennsylvania. The above formation of limestone, in the county of Albany, is superimposed, but more to the west, sandstone rests on the wacke slate. The latter rock passes under both, it appearing on each side. In setting out from the Mohawk river, and travelling southwardly, we find that it rises continually, notwithstanding it passes under the limestone and sandstone, till we have reached the hills of Otsego, Chenango, &c. The general rise, however, is from the neighbourhood of the Hudson. This rise continues westwardly as far as the middle of the county of Otsego, and a line northerly to the Mohawk. On the northerly side of the latter river it also rises, as may be seen in Hassencleaver mountain and the Highlands. In the Highlands it preserves its elevation to the sources of the Mohawk, Fish creek and Big Salmon river. From these streams it declines on the one side to Oneida lake, and the sandstone southwest of that lake; and on the other, it slopes away towards Lake Ontario, and passes under its limpid waters.

The principal formation is westwardly of the Hudson. The Kaatskill mountains and their branches, the hills of Schoharie, Delaware, Otsego, Chenango, &c. are mostly composed of this rock. It may be said to form all, or nearly all of their bases. The Kaatskill mountains, although stratified, stand on it.

On the east side of the Hudson, the grey wacke slate appears in fields and patches recumbent upon the clay slate. In Rensellaer, one of these fields occurs, which covers more than one-

half of the county. It is insulated, and lies immediately above the clay slate. Its center forms the middle and elevated part of the county. Professor A. Eaton compares it to the shield of a turtle. The same rock forms a large proportion of the basis rock of the counties southerly and northerly. It is the basis rock, of large proportions of the counties of Greene, Albany, Schenectady, Schoharie, Delaware, Otsego, Chenango, &c. So it is of most of the towns along the Mohawk, westwardly of the county of Schenectady. Wherever this rock rests on the clay slate, it is slaty, and has very much the colour, form and position of that rock. The same remark will apply, with some slight modifications, to very nearly all the rocks in low situations and deep cuts, such as ravines. We have already observed that it is finer and finer, and more slaty as it descends, and coarser and coarser, and in thicker layers, as it ascends. The deep beds of the Mohawk, Schoharie, &c. and the narrow ravines made by the Cayadutta, Platakill, Canajoharie, Caroga, Osquake, Nowadaga, Fulmer and Staring creeks, and also the beds of the two Canada creeks, Fish creek of Oneida lake, and Big Salmon river, afford examples. We might cite more river and creek valleys, dells and ravines, but these are sufficient.

The grey wacke slate is generally blackish; sometimes it is greyish, yellowish, bluish, &c. On ascending from the cuts or courses of streams, we find that it grows coarser. The fissile variety, or that which may be cleft, occurs. Its colours are bluish and greenish. It is often used as a building stone. The latter is found at Rensellaerville, &c. in the county of Albany; at Duanesburg, in the county of Schenectady; at Charlstown, in the county of Montgomery; at Carlisle, in the county of Schoharie; at Middlefield and Otsego, in the county of Otsego, and at various other places. The meeting-house at Esperance, in the town of Schoharie, twenty-eight miles westwardly of Albany, is built of it. This variety is in thick layers, which are divided by seams. Hence, it quarries very easily, and will hereafter be extensively used for architectural purposes. It is always above the fine. Rubble-stone usually

caps or covers it. The latter, in general, covers hills and mountains. In plains it is not unusual to see the rubble-stone cover the common wacke.

All the foregoing varieties of wacke we have noticed in the counties situated in the basins of the Hudson, Delaware, Susquehannah and St. Lawrence, so far as these basins come within this article. The soil, where the rock is fine and where it has depth, is often fertile; but in the fissile and rubble varieties, it is rather meagre. The lands, however, in the districts abounding with the latter, may be ranked among the most improvable in the State. Rubble-stone makes good fences. Those farmers who have gathered these stones and made fences of them, have doubled and even trippled the value of their lands. The counties of Albany, Schenectady, Montgomery, Schoharie, Otsego, &c. furnish many cases. Lands of the most unpromising kind have been rendered feasible, easy of tillage, and quite productive.

Hard pan is very common in the latter counties, and some others in the districts under examination. It is usually from one to two, or three feet below the surface. Its thickness varies from a foot to thirty and upwards. It is impermeable to water, and so hard and tough that it can only be broken with picks. Many stones, both flat and round, mostly, however, of the former description, and differing in sizes, are disseminated through it. Wherever hard pan prevails, springs and brooks, of durability, are scarce. The wells dug in hard pan are from ten to about thirty feet deep. The hard pan rests on the wacke.—In spring and autumn, and at all times when much rain falls, soils resting on hard pan, are considerably saturated. Hence they are more affected by excessive rains than any other soils, excepting stiff clays. Good cultivation will, however, in a measure, correct this.

Patches of shivery slate are numerous in some of the wacke districts. On exposure, slate of this kind breaks into lenticular pieces, and decomposes very rapidly. In three or four years the transition to soil is completed. Shivery slate occurs in the transition clay slate formation.

Hone slate is found in the town of Rensellaerville, in the

county of Albany; at Charlton, in the county of Saratoga, and in other places. Some specimens are very fine, and scarcely surpassed by the best oil stones. None of the quarries have, however, been opened and worked to any extent, as our people usually prefer the imported. The locality, in Rensellaerville, is one of the most extensive that is known. The layers alternate with those of the grey wacke slate.

The green grey wacke, the coarse granulated, the porphyritic, and the pudding stone varieties, are all found in various places.

The wacke of the districts under consideration is distinctly stratified; and the strata are, in general, either horizontal or nearly so. The strata are divided by fissures and seams. The seams, in the coarser varieties, are commonly very straight, and as smooth as if jointed.

Imbedded Minerals, &c.—Very thin layers of anthracite coal have been found in the grey wacke, in the vicinage of the Hudson, &c.

Glance coal, in very small quantities, has been found in the counties of Washington, Rensellaer, Columbia, Dutchess, Albany, Saratoga and Herkimer.

Iron pyrites, sulphuret of lead, iron ore, lead ore, &c. have also been found.

Rhombic calcareous spar fills the veins of some of the rocks, at Batenkill, in the county of Washington.

Organic remains—It is no unusual thing to find these remains in this rock, especially in the coarser varieties. We have often observed them in the counties of Schoharie, Montgomery, Otsego, Herkimer, Oneida and Oswego, both in low and elevated situations.

Pectenites are sometimes seen in great numbers. One of the most remarkable localities, we have observed, is on the south side of Big Salmon river, in the town of Richland, Oswego county, about three miles eastwardly of Lake Ontario. The cliff containing them, is by the road side leading to Rome, and is perhaps from one hundred and fifty, to two hundred feet above the level of Lake Ontario. The numbers are such that

they constitute no inconsiderable portion of the ledge. These remains are cotemporaneous in age with the rocks in which they are imbedded. It would appear from their positions, that at the period the animals existed, the materials composing the cliff were mud; and that the animals lived and died in succession on the spot, and were covered in succession by additional mud brought, and that subsequently the mud or loose materials hardened and passed into stone. This conclusion is deducible from the consideration of their being found in layer after layer.

Secondary slate—This is abundantly diffused over portions of the western country. It lies south of the great limestone formation, which we shall hereafter notice, and west of the grey wacke already treated of. It underlays the southwesterly part of the county of Onondaga; the northwesterly part of Courtland; the southerly parts of Cayuga, Seneca and Ontario; the middle and southerly parts of Livingston; the southerly parts of Genesee and Erie. The counties of Tompkins and Yates, parts of Steuben and Alleghany are mostly underlayed by the same rock. Slate is plentiful in the counties of Cattaraugus and Chatauque. The shore of Lake Erie, in the latter county, is slate, but we are unable to say whether it is transition or secondary. We shall give some of the localities.

Slate occurs in the southwesterly part of the county of Onondaga, around the head of Skaneatelis lake, and along the head waters of the Tioughnioga river, in the county of Courtland; around the greater part of Owasco lake, in Cayuga county—it forms the beds and banks of Salmon creek, in the same county. The banks of the latter stream are often very abrupt, and attain elevations from thirty to two hundred feet. Towards the upper part of the slaty stratum, blue limestone or shistose limestone, occasionally alternates with the slate. The whole town of Scipio, in the same county, has for its substratum, slate. Its usual cover is from ten to thirty feet, as is evidenced in digging wells. Blackish slate occurs around Owasco and Otisco outlets. The bed and banks of Fall creek, in Tompkins county, are slate. The falls on this stream, near to the village of Ithaca, consist of this rock. Some of the

superior layers in the vicinity of the falls, alternate with thin layers of limestone. This stream has worn for itself a very deep bed. The shores of Cayuga lake, south of the great limestone ledge, are mostly slate. Seneca lake is environed by slate. The same kind of rock is seen along the Cashong and around Crooked, Canandiagua and Canesus lakes, and thence westwardly to Genesee river, and up that river as far as Nunda. It is likewise seen in Allen's, Tonnawanta, Cattaraugus and other creeks, and along the shores of Lake Erie. The slate of this district is usually in thin horizontal layers.

"The aluminous shist, or clay slate, which forms or supports the subsoil, in the southern part of the county of Cayuga, and which constitutes the shore of Cayuga lake, wherever it is precipitous, crumbles when exposed to the atmosphere.

"The clay slate is found both to the east and west, and is situated immediately south of the great limestone ledge, which forms the dams of Cayuga, Seneca, Canandaigua and Erie lakes, on the one side, and Owasco, Skaneatelis, Otisco and Linklaen's, on the other. Like other clay slate, it abounds with the distinct remains of many species of the shell fish, &c. which in some places are so numerous as to constitute no inconsiderable part." See *Thomas' Travels.*

That part of Cayuga lake which is situated southerly of the limestone ledge, is very deep. The ice, in ordinary winters, very nearly marks out the boundary between the shistic and calcareous rocks. The whole lake does not freeze over unless the winter is exceedingly severe. The bottom of the lake, where deep, is supposed to be slate, and where shoal, limestone. Seneca lake is also very deep, more so than Cayuga, since it remains open during the coldest winters. As slate surrounds nearly all of this lake, it is inferred that its bottom is the same kind of rock.

"The clay slate crosses the country south of the ledge, occupying the space between Cayuga, Seneca and Canandaigua lakes." See *David Thomas' Travels.*

Shist is seen along the shores of those lakes, and along the road leading from Geneva to Canandaigua, and in the beds and banks of the rivulets that cross the road.

Clay slate forms the banks of Honeyoe lake, twelve miles southwest of West Bloomfield.

Slate is seen on the great road, six miles west of Batavia; also at Leroy and Clarence.

Bituminous slate occurs along the shore of Lake Erie, south of Eighteen Mile creek. It is nearly black, and disposed in thin tables. When heated in the fire, it has been known to afford a flame. The tract has considerable extent. Petroleum, or oil springs occur in it. These are a few miles southeast of the mouth of Eighteen Mile creek. Coal, it is likely, exists in their vicinity. In the county of Cattaraugus there is another of these oil springs.

The shore of the lake hereabouts, in part, consists of bluffs. Few are elevated one hundred feet above the water. The bituminous slate reposes on clay slate. The bituminous slate, at Honeyoe and Canesus lakes, and at the forks of Genesee river, is so highly charged with bitumen, as to be capable in some instances of supporting combustion.

Allum slate is found in various parts. It is plentifully distributed over the county of Genesee. &c. We have been informed by Dr. Hadley, Professor of Chymistry in the College of Physicians and Surgeons of the Western District, that the allum slate is disseminated very profusely throughout Genesee and some of the adjacent counties.

The slate which we have mentioned as pervading portions of the western country, it would seem, underlays the limestone formation in whole or in part. The Niagara, between the Great Fall and Lewistown, has opened a way through this rock, as well as through the limestone rock, which is incumbent upon it, and now flows in majestic grandeur beneath the bases of both. Here it is from forty to fifty feet thick, and overlays the red sandstone, which appears below it. It is very fragile, and when exposed to the weather, soon fritters away. The breakings off, and sinkings of large masses of the limestone rock at the falls, and on the margins of the deep ravine below them, are caused in a great measure by the rapid decomposition of the exposed parts of this rock. On both sides of the ravine, this brittle slate

is constantly falling to pieces, and running down upon the strands or into the stream. This occasions cavities under the limestone of considerable size, and portions of the latter rock being unable to sustain their own weight, break off and tumble into the abyss. The advance of the great cataract towards Lake Erie, is greatly accelerated by the splitting and falling down of the recumbent rocks. The debris, at the foot of the walls of the ravine, have been formed in this way. Some of them reach nearly midway. Dr. Mitchell calls the slate rock at these falls, brittle slate.

Shale—Shale occurs in different places in the State, in strata and beds in the clay slate, and in the alluvial districts. There are two kinds, it is said, the argillaceous and bituminous. Shale is massive; it has a slaty texture in one direction, and an earthy in the other. It disintegrates on exposure to the air, and passes into clay. Its colours are grey, bluish, yellowish and blackish.

"Argillaceous shale is found at the Killas of the Wallkill, near Montgomery, in the county of Orange. It abounds with shells of bivalve molluscas; such as anomias, terebratulas, &c. in these the real shells exist, being neither wasted away so as to leave cavities and impression, nor converted by petrifaction to a stony condition."—*Dr. Mitchell.*

Argillaceous shale is also found in several of the counties, in the basin of the Hudson. The same kind of shale occurs in various parts of the Oneida and Seneca vale. The Erie canal runs through some of the patches.

Bituminous shale is of common occurrence south of the great limestone ledge, between Skaneateles lake and Lake Erie. In the counties of Livingston, Genesee and Erie, some of the patches are considerable in size. Its colour is blackish, and even black.

"Black bituminous shale usually accompanies coal, and is sometimes intermixed with it. When subjected to the flame of a candle, it blazes; in the fire it crackles, yields a bituminous smell, and a black smoke; looses a considerable portion of its weight, and is converted into a whitish or redish flake." See *Philip's Mineralogy, p.* 70.

The black bituminous shale, and the black bituminous slate, of the western country, have often been confounded.

Indurated clay has been met with in the Oneida and Seneca vale, and in some other districts more westwardly. It is bluish, reddish, greyish, &c. and massive. In making the Erie canal, it occurred at several places: *to wit*, on the middle division, on sections, numbers 14-20-24-25-50-51-54-55, westwardly of Rome, in Oneida and Madison counties.

Fullers earth is by no means of unfrequent occurrence. Bole or ochre, of various colours, has been found in the counties of Albany, Herkimer, &c. Potters' clay abounds in a great number of places. Epsom salts are not unusual.

CLASS. III.

Sandstone—The sandstone district commences in the southeasterly part of the town of Germanflats, in the county of Herkimer, and extends nearly in a western direction, as far as the Province of Upper Canada. It is bounded on the south by the great limestone district, which we shall hereafter notice; on the west by the Niagara river; on the north by Lake Ontario, eastwardly almost to the mouth of Big Salmon river, in the county of Oswego; and on the north northeast by a part of the transition formation already described. On the east, or rather southeast, the sandstone passes under the limestone, only appearing in the northern declivity of the Osquake hill, or in insulated patches of very small extent. The district, taken together, is about two hundred and ten miles in length, from east to west, and from one to twenty-eight miles in breadth. The same formation, after crossing the river Niagara, is continued westwardly, as far or farther than the head of Lake Ontario; but it is not within the scope of this work to go beyond the State.—The sandstone of this district, on the south, passes under the limestone, composing the great limestone district. We shall give the width of some places. On the Niagara it is seven miles; on Genesee river six; at Little Sodus bay about twenty-four; between the mouth of Oswego river and the Erie canal,

in Camillus, which is pretty near the southern border, about twenty-seven; between the southeasterly part of the county of Oswego and Canasaraga, in the county of Madison, it is eighteen or nineteen miles; and at Oriskinney, in the county of Oneida, eight or nine miles. In Herkimer the width is inconsiderable.

The district contains the northerly parts of the counties of Niagara, Orleans and Munroe; the greater part of Wayne; the northerly part of Cayuga; the southwesterly part of the county of Oswego; the northerly part of Onondaga; the northerly part of Madison, or that part along the canal, and west of Oneida creek; a portion of the southerly part of the county of Oneida, lying on the north side of the great limestone formation; and a narrow strip in the county of Herkimer, between the latter formation and the transition.

The sandstone of this district, it is supposed, rests universally on the grey wacke slate. The order of the rocks, in the counties of Herkimer and Oneida, are as follows—First, grey wacke slate—second, grey sandstone—and third, red sandstone. The latter is the uppermost rock. Westwardly of the county of Oneida, the grey sandstone passes under the red and disappears.

The grey is seen in various places in the towns of Germanflats and Frankfort, in the county of Herkimer; and in the towns of Whitestown, Westmoreland, Vernon and Verona, in the county of Oneida. Professor Eaton remarks, that it is to be seen northwestwardly to Lake Ontario, between Little and Big Salmon rivers. See his *Geological Survey of the rocks along the Erie canal*, made by order of the Hon. Stephen Van Rensellaer, in 1823.

The red sandstone, in the towns of Germanflats and Frankfort, in Herkimer county, is southerly of the grey; in Paris, Kirkland, Vernon, &c. in the county of Oneida, the disposition is the same. This is observable along the hills bordering the Sauquait, Oriskinney, &c. Setting out from the vicinity of Oneida creek, and travelling westwardly to the Niagara, the red sandstone pervades the country. At first it is slaty and

fragile; afterwards it is in thick layers and is hard. Every where the layers are horizontal, or as near that position as can be imagined.

The Oswego river, from the falls downwardly, has laid it bare to a great extent. The same may be said of Genesee river, below Rochester—Oak Orchard, Eighteen Mile creek, and some other streams, have also uncovered it to some depth. The rock on Oswego, Genesee, Oak Orchard, &c. is quarried for building stone.

The surface of the formation presents various plains, elevations and depressions. From the confines of the county of Herkimer it descends westwardly to Seneca river, at the Montezuma marshes, where it is covered to the depth of eighty feet. From these marshes, it rises to the neighbourhood of Genesee river, where it again descends. Beyond this river it rises and falls several times, before it reaches the Niagara. From Oneida lake and river, and from Seneca and Canandaigua rivers, and Mud creek, in going northerly it at first ascends and then descends; in going southerly it ascends. The descent on the north ends at Lake Ontario. Between Wayne county and the river Niagara, its general descent is towards Lake Ontario. The descent towards the latter lake is made up of small offsets. In the Oneida and Seneca vale, and in the valley of Canandaigua river, the rock is almost every where covered by alluvions, &c. which preclude its being seen, except on their borders. The only evidence we have of the rock at Salina and Montezuma, is from boring and digging for salt and salt water. The vale and valley seem to have been the basin of a very considerable lake, which has been mostly effaced by the demolition of its barriers, and the filling up of its bottom. From Rome to Lyons may be considered a kind of trough, rising on the sides and ends. Between the east end of this trough and the west, the difference is not perhaps over fifteen feet. Oneida lake is about three hundred and sixty feet above tide water on the Hudson; and the Seneca river, at the Montezuma marshes, about three hundred and seventy. The surface of the marshes is not five feet higher. The bottom of the trough then, is be-

tween these extremes and the foot of the hills, southerly of the canal, and the spine northerly of Oneida lake and river, and Seneca river; and the ends between them and Rome and Lyons.

In this district some small tracts of secondary formation are to be excepted. In due time we shall notice them, or such as seem to require notice.

The lands, comprehended in this district, are fertile, and may be classed among the best in the State. The aspect of the whole is somewhat diversified.

The following extracts, except as to some occasional remarks, are borrowed from a geological survey made of the country along the Erie canal, by Professor A. Eaton, in 1823, under the patronage of the Hon. Stephen Van Rensellaer. The sandstone rock (mill-stone grit, as he calls it) may be seen reposing on the transition grey wacke slate, at Steel's, Myer's and Ferguson creeks, in the county of Herkimer (on the south side of the Mohawk ;) at Starch Factory brook, near Utica, and in the northwestern corner of Westmoreland, in the county of Oneida. It may also be seen six miles south of Rome, in the same county. West of this county, he supposes that it passes under, what he calls, the saliferous rock (red sandstone.)

The grey sandstone, (or mill-stone grit, as he calls it,) he thinks, where it appears in full thickness, is from forty to sixty feet, in several perpendicular ledges. We think that the stratum on the farm of Mr. S. Brewster, in Germanflats, and the same a little west, below Tisdale's mill, in Germanflats, is thicker. Mr. Eaton adds, that it does not pass into, or alternate with the grey wacke slate, on which it is based. The last remark we can confirm, as we have examined several of the streams that flow over both rocks before they reach the Mohawk. The wacke passes immediately under the grey sandstone, without changing its direction, or mixing its layers.

The saliferous rock, (red sandstone,) he says, may be traced from near Little Falls, in the county of Herkimer, to the west end of Lake Ontario, about two hundred and fifty miles. We have seen this rock at Mr. Van Horne's mills, in the town of

Stark, still more to the east, but the latter place is out of the district. Mr. Eaton observes, where it crops out on Steel's creek, and some other places, it will average about eighty feet. It is much thicker in the west. Mr. Byington, of Salina, in the county of Onondaga, bored through it on the marsh, at the head of Onondaga lake, and found it about one hundred and thirty feet thick. After passing through it, he came to a conglomerate rock. He found salt water above the sandstone, and in it, but none below. The water was not abundant. About one hundred and seventy feet may be seen on Genesee river, in the vicinity of the Great Fall at Carthage, in the county of Munroe. Two declivities, and some slopes must be coupled in order to obtain one hundred and seventy feet. At Oak Orchard creek, in the county of Orleans, Mr. Bennet penetrated the same rock, one hundred and forty feet, for the purpose of obtaining salt water. This is about seven miles south of Lake Ontario—but he did not pass through it. On the Niagara river, about as much may be seen in the ravine below the falls, and on the borders of the steep, at Lewistown. Along Oswego river, seventy or eighty feet may be seen between the falls and Lake Ontario, in some places.

The descent from the Osquake hill, in the county of Herkimer, to the Montezuma marshes, is between six and seven hundred feet—and the ascent, from thence to the summit, east of Genesee river, about one hundred and thirty.

This stratum is disposed in some parts in thick layers, and in others in thin. In several of the counties it answers for building-stone. The cement, it appears, is argillaceous.

Animal remains have been found in the sandstone rock of this formation. In Germanflats, there are prodigious numbers of small bivalve shells.

Red sandstone occurs in the Kaatskill mountains, and some of their branches. It is found in the counties of Greene, Schoharie and Delaware, in fields upon the grey wacke slate. In some instances, it constitutes considerable portions of the mountain ranges, and has great thickness. In Delaware, it is seen in some of the valleys. The grey sandstone is also found in

some of the mountains, on the grey wacke slate. In the town of Blenheim, in the county of Schoharie, the latter is extensively quarried for grind-stones.

The red sandstone, of the Kaatskill mountains, it is said, is a transition rock.

Grey Feeke, or Greyband—This rock appears in Herkimer and Oneida counties, in some places overlaying the red sandstone. It is also seen in the banks of Genesee river, directly below the Great Fall at Carthage. It likewise occurs in the banks of Oak Orchard creek, a little above its mouth. At these places, it rests upon, and is covered by the red sandstone. In some places it is hard, and in others not. Professor Eaton says, it is four feet thick in Genesee river, and fifteen feet in most places where it projects. Its usual colour is greenish-grey.

Ferriferous rock—This rock, in some places, reposes on the grey feeke, and in others not. It occurs in sundry places between Germanflats and Niagara river. According to Mr. Eaton, it is ten feet thick at Verona, in the county of Oneida, and somewhat thicker in some other places. It is both hard and soft. Its colours are bluish, greenish, &c.

The latter rock often supports and covers a stratum of argillaceous oxide of iron, varying from one to two feet in thickness. The ore, in the county of Herkimer, is too meagre to work, but that found in the county of Oneida, and westwardly, is generally rich, yielding from fifteen to thirty per cent. The best is soft and unctuous, and may be rubbed to pieces between the fingers. In some places the ferriferous rock underlays the whole, while in others, the stratum of oxide of iron alternates with the sand rock. In digging the ore, portions of the sub and super rocks are occasionally taken up with the former, both being united by a cement. Marine and fresh water petrifactions have been found in the stratum of iron oxide, and in the sandstone rock.

Limestone Formations.

Limestone is very abundant, and occupies some large and small tracts in the State. We intend to speak of the several formations, so far as our information extends. In general, the limestone is incumbent upon clay slate, grey wacke slate, calcareous sandstone, sandstone or secondary slate. We shall begin with the central formation, because it has greater extent than either of the others. We have called it central, because it extends from east to west, nearly through the midland parts of the State.

This formation commences in the town of Coeyman's, in the county of Albany, a few miles west of Hudson's river, and runs westwardly to the Niagara, which river it crosses into the Province of Upper Canada, and pursues its way in that Province to Grand or Ouse river, or farther. In its way to the Niagara, it passes through the counties of Albany, Schoharie, Otsego, Onondaga, Cayuga. Seneca, Wayne, Ontario, Livingston, Munroe, Orleans, Genesee, Erie and Niagara. It has an extent of about two hundred and forty-five miles in this State, and an average breadth, including its outgoings or cropings out, of about ten miles, which would give a superfices of two thousand four hundred and fifty square miles. On the east, it is limited by the clay slate district; on the north by the grey wacke slate and sandstone districts, &c.; and on the south by the secondary slate district, and the district of grey wacke slate, on that side. The patches and beds of gypsum are either along, or on its northern borders, or in certain lines stretching across the formation.

The formation, taken together, has considerable elevation and thickness. In the county of Albany, its summit is from five hundred to seven hundred feet above the level of the tide water on the Hudson; in the counties of Otsego and Herkimer, from twelve hundred to fourteen hundred; in the counties of Oneida, Madison and Onondaga, from eleven hundred and fifty to eight hundred and fifty, the elevation declining as we go westwardly; at Cayuga lake, three hundred and seventy; at and along Genesee river, from five hundred to five hundred

and thirty; and at the Niagara river and Lake Erie, from five hundred and fifty to six hundred feet. From the foregoing data, which do not vary much from the truth, it will be perceived that the formation from Coeyman's, in the county of Albany, to the sources of the Susquehannah, in the counties of Otsego and Herkimer, continues in the main to rise; that from thence to the confines of the county of Cayuga, it preserves a pretty uniform elevation, though falling some; that from thence to Cayuga lake it descends very considerably; that from thence to the Genesee river it ascends very gradually; and that from thence to the Niagara, it retains nearly a uniform height, although on the whole rising.

The surface of the formation displays great diversities in its aspect. In some places it is romantic, in some picturesque, and in others beautiful. The formation has less breadth in the east than it has in the middle and west. Between the counties of Herkimer and Otsego, it is from four to five miles broad; in the counties of Madison, Onondaga, Cayuga, Seneca, and part of Wayne, it is from nine to ten; at Genesee river fifteen or sixteen; at Niagara and Lake Erie about twenty-five. After it has reached the county of Ontario, it spreads, and continues to spread, till it has gone beyond the boundary of the State. From Springfield, in the county of Otsego, eastwardly to Sharon, in the county of Schoharie, it is quite narrow. At Cherry Valley, between Springfield and Sharon, it is only about three miles in breadth. Limestone is found at the village, two miles north, and about a mile south, underlaying the valley. In the county of Schoharie it widens. Dr. Frisbie, of the county of Onondaga, in a letter to Dr. Hosack, of the city of New-York, published in the American Medical and Philosophical Register for 1814, says, "that limestone extends from the eastern to the western extremity of the military lands, and that it is from ten to twelve miles wide." The military lands are between the counties of Madison and Ontario. We would, in this place, remark, that we have travelled from Schoharie creek, over the formation, westwardly to Upper Canada, and have crossed it in various places, at different times.

The limestone of this formation is disposed in layers, which usually range with the horizon. Between Coeyman's, in the county of Albany, and Cayuga lake, the layers are in general thicker than they are between the latter lake and Niagara river. Those between the latter limits are often thin and slaty. The limestone, east of Cayuga lake, is excellent for building and other purposes. Many of the locks on the Erie canal are constructed of it. The limestone, comprising this formation, presents many varieties; perhaps every one belonging to secondary rocks, passing under this general denomination. Much of the limestone west of Cayuga lake, is that kind called swinestone, or stinkstone. When burnt or struck with a hammer, it gives out a fetid odour. It abounds with chert or hornestone. The latter, however, is not peculiar to this part of the formation, only it is more abundant in some places, particularly between Genesee and Niagara rivers, than it is eastwardly of Cayuga lake. We have seen much hornestone in the counties of Onondaga, Herkimer, Otsego and Schoharie. Every where it is imbedded and subordinate to the rocks composing the formation. Its colours are blackish, brownish, yellowish, &c.

The formation, taken together, may be pronounced secondary. This formation is composed principally of rocks belonging to first secondary limestone—second secondary limestone—third secondary limestone—and fifth secondary limestone. We shall notice some of the characters. The colour of the first is, in general, blue; sometimes grey. Its fracture is splintery, or granular foliated: its lustre varies from glistening to dull; and it is translucent or opaque on the edges. The stink, or swinestone, we include, in part, under the same designation. The stratification is perfectly distinct. Caves, cavities and tunnels are not uncommon. Brooks and springs have their courses in some of the cavities or interstices, and flow in subterraneous ducts. The counties of Albany, Schoharie, Otsego, Herkimer, Oneida, Madison, Onondaga, Cayuga, Seneca, &c. afford abundant examples. In these counties large springs, from whence streams flow of sufficient capacity for

mills, are to be seen, while streams of similar size are to be seen sinking beneath the rocks.

It frequently contains chert or hornestone, very much resembling gun flint. Petrifactions are not of unusual occurrence in it. Tufa, magnesian limestone, sandstone, slate clay and bituminous shale are now and then found in it. The latter may be deemed subordinate rocks.

Tufa occurs at the Osquake, in the county of Herkimer; at Chitteningo, in the county of Madison; at Nine Mile creek, in the county of Onondaga, and many other places: magnesian limestone, at Cherry Valley and Springfield, in Otsego county; at Germanflats and Warren, in the county of Herkimer; and slate clay, and bituminous shale, in the county of Livingston, &c.

The colour of the second is, in general, grey. It abounds with shelly remains, and is called by some shell limestone. It is generally glistening and glimmering, and small granular. Some of it is flexible. It rests upon the preceding, but does not form a continuous stratum, being found in small patches and fields. It in certain places rises into hills, one hundred feet high or upwards. It is common west of Cayuga lake, although now and then found east. The same kind of rock is of very common occurrence in the second district, as to extent, and even in others. The second district extends from the Mohawk to the river St. Lawrence.

The third secondary is found mostly west of Cayuga lake, although the second and first secondary are not without being found. It usually lies either on the sandstone or slate. At the Niagara, this rock rests on fragile slate, which we have already noticed. Superimposed on this rock, is found, on some occasions, an imperfect kind of sandstone, marl, bituminous shale, shale, indurated clay, &c. The bastard limestone is of frequent occurrence throughout the formation. It is a coarse calcareous stone, of granular structure, containing the residual of shells. It is very abundant in some parts of the first and second limestone districts. It resists fire for a long time. In those dis-

tricts where it abounds, the inhabitants have availed themselves of it for chimney backs, jambs, hearths, &c.

The fifth secondary limestone comprehends fresh water limestone, an impure sandstone, or such as is mixed with the carbonate of lime, or with argillaceous earths, &c. The rocks belonging to this description are local, insulated and subordinate to the others. On the southerly side of the Oneida and Seneca vale, and bordering it, and perhaps more westerly than this, we have noticed the following rocks, beds, &c.—First, fresh water limestone, or silicious limestone, suitable for cement—second, argillaceous limestone—third, sandstone, of a very coarse grain, and not very regular in its structure, being a more recent sandstone—fourth, gypsum—fifth, marl, &c., interspersed with beds of clay, loam, sand, gravel, &c. We have mentioned these, not that they always occur one above another, or that one has a higher relative position than another, but because they are of ordinary occurrence; the one now and the other then, being at times, seen to hold superior positions. The silicious limestone contains much sand, so much so, that it is often used after being quarried, burnt, ground, and made into mortar for cement, without any foreign mixture or preparation. Cement, made of this rock, was universally used in constructing the locks on the Erie canal. This rock is stratified, and the strata are hard and soft.

We shall, in the next place, mention some of the localities belonging to the first great formation. In the county of Albany, the Helderberg, for many miles, presents almost a perfect mural wall which rises from three to four hundred feet above the plain.

Along Schoharie creek, in the county of Schoharie, the limestone appears in ledges, cliffs and walls. In the vicinity of the court-house, on the west side of the stream, there is one of these walls, of the extent of a mile or more, which rises nearly two hundred feet. The same rock emerges in many places in the towns of Cobuskill, Carlisle and Sharon, in the same county. In travelling westwardly, on the state road, from Carlisle meeting-house, to the Otsego border, a distance of twelve miles, the

rock shows itself at short intervals all that way. We ascend several short steeps that cross the road. Those parts of the latter towns, situated in this formation, are hilly. The same rock is seen in the towns of Cherry Valley, Springfield and Richfield, in the county of Otsego—and in the towns of Stark, Warren, Columbia, Lichfield and Winfield, in the county of Herkimer, in innumerable places, rising above the soil. These towns, so far as they are embraced in it, excluding Cherry Valley, have a beautifully waved surface, the limestone rising into swells and hills. The northerly part of Otsego lake dips into the formation. The rock is very conspicuous in the counties of Oneida and Madison, in the towns of Bridgewater, Sangerfield, Madison, Eaton, Nelson, Cazenovia, &c. The bed of Chitteningo creek, for some miles, and the hills extending along it, are limestone. The rock constituting the high falls on that stream is limestone. In the counties of Onondaga, Cayuga and Seneca, the same rock displays itself along Limestone, Butternut, Onondaga, and Nine Mile creeks, Skeneatelis, Owasco and Seneca outlets. The streams have, in many places, laid its strata bare to great depths. Butternut, Onondaga, and Nine Mile creeks, run in deep ravines. The rock, however, is not confined to these streams and their borders, but shows itself often in the spaces between them. Green Pond, in Manlius, Onondaga county, is environed by a limestone dyke, which is generally very precipitous. At Cayuga lake we lose sight of the rock, since it passes under that lake. It, however, soon rises, showing itself along Seneca outlet, where it forms falls and several rapids.

Between Seneca county and Genesee river, limestone is of very ordinary occurrence. The latter river passes over it for many miles. The rapids and falls at Rochester are occasioned by it. Below the great fall at the latter place, the bank on the east side of the river, exceeds one hundred and twenty feet perpendicular elevation. The falls, themselves, are ninety-seven feet, and they are lower than the surface of this part of the country.

Between the rivers Genesee and Niagara the limestone rock

displays itself eminently along streams in ledges, and various places, in naked patches. The streams descending in the directions of Lake Ontario, Genesee and Niagara rivers, have denuded it in very many places. Human industry and perseverance have also been active in laying it bare for our inspection. At Lock Port, and its vicinity, in the county of Niagara, about three miles have been laid bare, and perforated to the depth of from three to thirty feet. On Niagara river, from Lewistown to the falls, and we might add, to Black rock, (for the alluvial detritus, between the head of the falls and Tonnawanta creek, does not form an exception,) the stream has laid it bare, and opened to view a fine section. The view is perfect up to the falls, and the head of the rapids. The thickness of the rock is determinable up to the great fall. Above this we cannot determine it with certainty. Limestone occurs along Lake Erie, as far as Eighteen Mile creek, overlaying the slate. The same rock pervades and occupies much of the surface of the country, east of Buffalo, for twenty-five miles. It is undoubtedly continuous. The great road often passes over the bare rock. At Caledonia, in the county of Genesee, and thence westwardly for two miles, there is very little soil on the rock. In this field, four or five acres, admitting of tillage, are rarely to be found. In Allen's creek, in the county of Genesee, this rock is found in its bed and banks for miles. Thomas, whom we have had occasion to mention more than once in this chapter, in his valuable travels, says, that limestone underlays the country west of Genesee river.

The shelly limestone is incumbent on the blue, and does not form a continuous stratum, being in patches and small fields.

The marble quarries which are known, or such as have come under our observation, are at Cherry Valley and Springfield, in the county of Otsego and Warren, and Germanflats, and Columbia, in the county of Herkimer. Others unquestionably exist. We intend to confine our remarks mostly to the quarry at Cherry Valley, because it has been opened and worked for some years, and is better known; and because the stone is in considerable repute for certain uses and purposes. The stone

constituting this quarry, or field, extends lengthwise along the valley, a mile and upwards, running from north to south. Its breadth, it would seem, is less since it appears to be limited by the hills forming the outlines of the valley. The rock is of the calcareous kind, and contains magnesia, which is very manifest on the surfaces of the layers. The laminæ are thick and disposed in a horizontal manner. The fissures are latitudinal and longitudinal. The colour of the rock is grey. Several acres at the quarry are bare. The layers are from one to three feet thick. Shafts, from twenty to fifty feet in length, may be split off. When subjected to the chissel, the marble of this quarry receives a good polish. Exposure to the air adds hardness to it. It is wrought into jamb, chimney, and hearth pieces, tomb stones, &c. It is a very durable firestone. The marble of Springfield has been used for hearths, jambs and backs.—The marble of these quarries abounds with organic remains. Among these we have noticed zoophites, madreporites, cornuites ovites, and pectenites.

Hornestone is of common occurrence in the formation. We have already adverted to it. It sometimes fills up fissures and chinks, and at others, forms small beds and thin layers. We have seen it in the counties of Schoharie, Otsego, Herkimer, Onondaga, Ontario, Munroe, Genesee, Erie and Niagara. It is much more plentiful west of the county of Cayuga, than it is east. It is blackish, brownish, greyish, yellowish, &c. Some specimens very nearly resemble gun flint. In the Oak openings, in the counties of Genesee and Erie, the limestone encloses nodules of hornestone. The same kind of hornestone is found in the debris at the falls of Niagara, accompanied by radiated quartz, rhomboidal crystals of carbonate of lime, foliated gypsum, &c. The Agoneaseah used hornestone for axes, arrow heads, spear heads, chissels, gouges, &c.

Calcareous sandstone occurs in some places in patches and small fields. Sand predominates at one time, and calcareous matter at another. The rock is in thick and thin layers; usually the former. Professor A. Eaton, and Dr. T. R. Beck, in their Geological Survey of the county of Albany, give an ac-

count of a highly interesting locality in the Helderberg. The account is too long for insertion here. Others, having equal interest, are found in the counties west of Albany. It is a very common rock in all our limestone fields. To us it appears to hold the same station in regard to limestone, that the coarse sandy wacke does to the fine.

Beautiful and very perfect crystals of quartz are found in this rock. Some are very large and highly transparent.

Slaty silicious limestone is another subordinate rock in this formation. It is found in patches in several places. The layers vary from half an inch or less to twelve or more, and are on a line with the horizon. Its colour is bluish, brownish, &c.; in the county of Onondaga, it is not unusual to find it overlaying the water limerock.

Porus sandstone, with a small portion of the carbonate of lime, also occurs. It is very open in its texture. In some instances it is incumbent on the limestone, and in others on the slaty silicious limerock, It is ordinarily in thick layers, separated by natural cleavages.

Secondary Clay Slate—Patches of this rock are now and then found on the formation. This rock, like the preceding, may be pronounced subordinate. We have observed several of these patches in the county of Onondaga.

Veins of calcareous spar often traverse the limestone of this formation. It is also seen filling up some of the rents. Its colours are various. Stalactites abound in some of the subterranean recesses, and are often large.

Sulphate of zinc, barytes, strontian and lime, fluate of lime and snowy gypsum have been found; also, quartz crystals. The fluate of lime often occurs in small pieces; sometimes attached, and sometimes loose.

Throughout the whole formation organic remains are found, and often in great numbers. The following may be enumerated:—Nerites, cornu madreporites, zoophites, terebratulises, pectenites, ovate anomites, cordate anomites, gryphites, turbinites, terebrites, buccinites, potamodes, orthocerites, stylastrites, anthocephalites, isidites, arbo-madreporites, encrinites,

trilobites, favosites, cornuamanonites, corallinites, anomias, oysters, &c. To give localities would be superfluous, since most or all of the foregoing, besides many others, may be found in every county. *Dr. T. R. Beck, and Professor Eaton have made out large catalogues.*

The second formation, as to extent, commences in Montgomery county, at or near Anthony's Nose, and runs up the Mohawk, occupying, in some measure, both sides of the river, chiefly the north side, to the west side of Fall Hill, where it leaves the river, and stretches across the country to Lake Ontario, and the river St. Lawrence, which it crosses. It passes through the counties of Herkimer, Oneida, Lewis and Jefferson, being about one hundred and twenty-five miles in length. Its breadth varies in different places, and cannot be stated with much certainty. In Montgomery and Herkimer, as far as Fall Hill, it may be from one to three miles. In Herkimer, northwest of Fall Hill, it is not much broader, being no where over four miles and a-half, and often not above two. In Oneida it is broader and continues to spread. Measuring from Black river, at the Great Bend, westwardly to Lake Ontario, its breadth is twenty-five miles. On the St. Lawrence it is still broader. We have not been able to ascertain how far it extends down the St. Lawrence; nor do we know whether it stretches westwardly after crossing that river, and joins the central formation, which also crosses into Upper Canada. Its boundaries are not easily defined. In this State Lake Ontario bounds it on the west, from a little south of Big Sandy creek, in the county of Jefferson, to its outlet; the river St. Lawrence is to the northwest; Black river, from near the Great Bend, bounds it on the northeast upwards of forty miles; the other parts are bounded mostly by the grey wacke slate districts.

It occupies very small portions of the towns of Root, Canajoharie and Minden, in the county of Montgomery; considerable portions of Palatine and Oppenheim, in the same county; parts of Manheim, Herkimer, Fairfield, Newport and Russia, in the county of Herkimer; parts of Trenton, Remsen, Boonville, &c., in the county of Oneida; most or all of the towns

of Lyden, Turin, Martinsburgh, Lowville, Denmark, Harrisburg and Pinckney, in the county of Lewis; and nearly all of the county of Jefferson.

The formation, taken together, does not contain much, if any, under 1100 square miles.

Throughout the whole extent of the formation the limestone appears at short distances above the soil, sometimes in small, and in others, in large masses. Along the Mohawk valley it is frequently interrupted by sandstone and calcareous sandstone; the latter usually underlaying it.

The limestone in the towns of Root, Canajoharie and Minden, is insulated and in small patches. The rock, in general, from the Nose to the Osquake, is a calcareous sandstone, and in some instances a sandstone. These rocks commence on the bank of the river, and after passing the Nose, recede and skirt the flats. The Erie canal runs now at their base, and then not. These rocks do not extend back of the first river hill. They are succeeded by the grey wacke slate. This rock is seen in Platakill, Canajoharie creek, &c. The bluff, at the Nose, on the south side of the river, for a quarter of a mile, has an abrupt front of 200 feet elevation. Before the construction of the canal, there was only room for a road at its base. The sandstone on the north side of the river, begins upwards of a mile below the Nose, and extends up the valley two or three miles, usually exhibiting a perpendicular front. It then gives way to the same calcareous sandstone. The latter rock, westwardly, in the river valley, as far as Manheim, prevails, although limestone is of frequent occurrence. In many instances the former passes imperceptibly into the latter.

The limestone usually commences on the river hill. In some instances it encloses or surrounds small fields of slate. The slate of these fields rises above it, never having, as it would seem, been covered by it. The same is observable in Fairfield, and some other towns in the county of Herkimer. Some imagine the slate to be a subordinate rock, but our opinion is otherwise. The lime rock is sometimes thinly superimposed over the sand and calcareous sand rocks, while at others, it is

wanting. In the counties of Montgomery and Herkimer, streams are to be seen flowing on slate, while the limestone is in view at only a short distance. Caroga, East and West Canada creeks may be adduced as examples. The East Canada, for a mile above its mouth, runs on a slaty bottom. The rock is blackish, fine, smooth, and disposed in thin plates. Above this the calcareous sandstone appears along the banks of the stream, and above the latter the limestone. The limestone is about half a mile north from the river road. At Christie's, or Beardsley's Falls, on the latter stream, all these rocks may be seen. The creek's bed, up to the foot of the falls, is slate; then succeeds the calcareous sandstone; and lastly, the limestone. The falls themselves are limestone. The falls and rapids extend upwardly nearly a mile. The probable descent is 160 or 170 feet. Along the falls and rapids are very valuable quarries of limestone. On the west side, in the town of Manheim, quarries have been opened and extensively used for locks, aqueducts, &c. The layers vary from one to three feet. The same rock emerges on Fall Hill, on the north side of the river. In the vicinity of Little Falls village, quarries have been wrought. The limestone is on a calcareous sandstone, which rests on granite or gneiss. The disposition of the different rocks is easily seen at this place.

Limestone frequently rises in view between the Little Falls and Trenton Falls. The streams have uncovered it in sundry places. It is underlayed by slate sandstone and calcareous sandstone. The bed of West Canada, about a mile and a-half from its mouth, is slate, like that of the East Canada creek. This rock constitutes its bed about three miles, when it passes out of view under the calcareous sand rock. In some places the latter is a real sandstone. The calcareous sand rock is seen upwardly for six miles. It is also seen in the banks and sides of the hills, but not far back. The primitive rocks, in some places, break through it. Half a mile above Middleville, in the town of Newport, there is an instance. The limestone is above the calcareous sandstone, mostly on the left side of the stream, and a little back; some small patches only being found on the

right side. At the village of Newport, limestone forms the bed of West Canada creek. The same rock we have seen underlaying the stream in two places, between this and Trenton Falls. The formation seems, however, to be a short way from the stream's left bank, almost up to the mouth of Cincinnatus creek. West Canada creek, at Trenton Falls, has worn out a very deep course for itself in the rocks. Hereabouts the stream runs over limestone for six or seven miles. Its bed is very winding. The formation, where the creek crosses it, is not four miles broad. The ravine at Trenton Falls is over two miles in length. The rock is found about two miles and a-half above, and a mile and a-half, or more, below. The rocks, at the ravine, are laid bare to the depth of from sixty to one hundred and seventy feet. The limestone, at these falls, exhibits varieties. Cincinnatus and Steuben creeks have floors of the same rock. These streams are in the county of Oneida, and make their way into West Canada creek, a little below Trenton Falls.

In travelling from the village of Trenton, in the latter county, to Leray'sville, in the county of Jefferson, a distance of sixty miles, limestone is constantly appearing along the highway, except on the Highlands of Black river, for two miles, where it is covered with earth. It constitutes the floors and banks of all the streams, which descend into Black river, on the left. The bed of this river, from the Great Bend, to its mouth, is the same rock. Most of the country is hilly. We can trace the limestone from the bottoms to the tops of the hills, and from their tops to their bottoms. In the town of Denmark, in the county of Lewis, it is denuded in some places to the extent of acres. The surface is rent with fissures. Along Black river it is now seen in perpendicular masses, forming high banks and then in ledges. In several places it forms cascades and heavy rapids. From Leray'sville, it is found on the one hand, to the River St. Lawrence, and on the other, to Sacketts Harbour, and southwardly to Big Sandy creek. The shore of Lake Ontario, from near the mouth of Big Sandy creek, to its outlet, is limestone. The ravine at Trenton Falls, the beds of Deer creek and Black river, and above all, the hills in the county of Lewis, would lead

us to believe, that the formation, after reaching Trenton Falls, has great thickness. West Canada creek, at Trenton Falls and Deer creek, which falls into Black river, in Lewis county, present deep sections, and good examples.

This formation exhibits a very diversified surface. From its commencement in Montgomery county, it, in the main, rises till it has reached the summit of the Highlands of Black river, where it attains an elevation of from 1,220 to 1,400 feet above the ocean. Thence to Champion, on Black river, it falls. Here a kind of plain begins, which continues northerly to the St. Lawrence, and westwardly to Lake Ontario. In Lewis, and on the borders of Jefferson, the aspect is broken with hills. The soil in some places is fertile, and in others meagre.

There are two principal kinds of limestone in this formation; the one is blue and the other grey. The former extends throughout the district, the latter is insulated, and rests on the preceding. The blue is quarried for locks and building stone. The grey is used for the same purposes, and also for jambs, hearths, and tomb stones. Both kinds are compact and often disposed in thick layers.

Subordinate rocks—Among these may be enumerated calcareous sandstone, porous sandstone, &c.

Hornestone is occasionally seen in the fissures. Calcareous spar, barytes, strontian, fluate of lime, zinc, crystals, &c. occur.

The limestone of this formation is cavernous. The caves at Root, in the county of Montgomery, and at Watertown and Brownville, are in it. Holes, or chasms, which swallow up streams, are not unusual. One of these, near the Little Falls, ingulphs a stream, which it disgorges at the distance of half a mile.

Limestone occurs in the counties of St. Lawrence, Franklin, Clinton and Essex. In the first it is abundant, but not, we believe, in the others.

The third formation, which we intend to notice, begins on the confines of Vermont, a few miles northeasterly of White Hall, in the county of Washington, and runs southwesterly, to the town of Florida, in the county of Montgomery. It is be-

tween sixty and seventy miles in length, and from two to four miles in breadth. Dr. J. Steel estimates its breadth, in the county of Saratoga, at three miles. This formation extends entirely through Washington and Saratoga counties. It crosses the Hudson at Glen's Falls, and the Mohawk, above Schenectady.

Limestone appears along Wood creek; at Glen's Falls, and their vicinity; at and near Saratoga Springs; in Milton, Galway, Charlton, Glenville, Rotterdam, Amsterdam and Florida. Much of the formation between Wood creek, in the county of Washington, and Galway, in the county of Saratoga, is covered with sand and sandy loams.

Calcareous sandstone, porous sandstone, and firestone, an impure limestone, called by some bastard limestone, occur as subordinate rocks.

Hornestone is at times found imbedded in the limestone.—Calcareous spar, of various colours, traverses some of the seams. Sulphates of barytes and strontian, and fluate of lime, are found. Quartz crystals, of a beautiful transparent colour, occur abundantly, at Galway, and other places, in the rocks.

The limestone of this formation, is arranged in horizontal layers. Its most usual colours are blue and grey. The grey is in patches, and rests on the blue. It abounds most in organic remains. Dr. Steel, in his Geological Survey of the county of Saratoga, enumerates, among others, the following celleporites, pectenites, orthoceratites, gryphites, ostryalites, amonites, corallinites, cardites and terebratulites.

In the county of Wayne, about three miles south of Lake Ontario, there is a range of limestone. It crosses Great Sodus bay. It is chiefly composed of shells and other organic relicts. On the east side of the bay quarries have been opened and wrought. The stone takes a polish. Remarkably fine crystals are imbedded in it. This range is insulated and limited in extent. It is in the sandstone district, and is supposed to be incumbent on that rock.

Thomas, in his travels, says, that the fragments of this rock are not extensively scattered on the hills south of the range.

In the counties of Steuben, Alleghany, Cattaraugus and Chautauque, there are fields of limestone, but they have no great extent.

Transition limestone—This rock occurs in the southeasterly part of the county of Washington, and in the easterly parts of Rensellear and Columbia. It joins and alternates once or twice with the transition clay slate, wherever it has been examined. Its colours are bluish, blackish, &c. It is traversed by veins of milk-white quartz. Chlorite is found in it. See *the Geological Survey of Rensellear county, made by Professor Eaton.*

There is a limestone formation, of considerable extent, in the counties of Dutchess, Orange and Ulster. According to the account given by Dr. Mitchell, it commences on the northeast at the partition hills, in the county of Dutchess, and runs in a southwesterly direction, to the Hudson, which it crosses, and penetrates Orange and Ulster counties. It is commonly seen in valleys, and on the borders of streams. At and near Newberg it shows itself along the banks of the river. It reposes on clay slate. It is a good building stone. Much of the lime used in the city of New-York, is made of this rock. Dr. Mitchell calls it a transition rock. This formation, and the preceding, are probably only one.

Limestone is abundant in the towns of Kingston, Esopus, Hurley, &c. in the county of Ulster.

Marble occurs in the towns of Kingston, Hurley, Esopus and Marbletown, in the same county. It is black, striped, veined and spotted. It takes an exquisite polish. The black marble found at Kingston, Dr. Mitchell calls lumachella marble. The marble of Ulster county has not obtained much repute in New-York.

Fresh water limestone has been discovered in most or all of the towns in Ulster in which marble abounds. It has been used for cement, in the construction of the locks on the Hudson and Delaware canal. The demand for fresh water lime has already been considerable in the city of New-York.

In the county of Greene, westwardly of the villages of Catskill and Athens, there is a ridge of limestone, but we are not

informed of its extent. It is upwards of a mile west of the former village, and three west of the latter. The Athens turnpike crosses it. It has an undulating surface, which often exhibits bare masses of rocks. Lousler'sburg, four or five miles west of Athens, agreeable to the report made by Messrs. Jabez D. Hammond and Joshua Pitcher, two of the state road commissioners, is 322 feet above the tide waters of the Hudson.

Small fields of limestone are not of uncommon occurrence in the basin of the Hudson. In the county of Columbia, half a mile westwardly of the village of Claverack, there is one containing seven or eight hundred acres. The rock rises abruptly, and is partly bare. Slate underlays it.

Dr. Mitchell, in his Minerological Survey of the country along the Hudson, in 1797, says, the rocks exhibit the likenesses of sea shells; and that, on being broken, their internal substance is found to consist of the coverings of marine animals. He further adds, that at the time they lived, the waters of the ocean must have stood over this part of the continent.

Patches of limestone occur at Verplank's Point, Tarrytown, &c. below the Highlands.

Fresh water limestone—This rock is found at Chitteningo, in the county of Madison; at Manlius and Camillus, in the county of Onondaga—at various places, in the counties of Cayuga, Wayne, Ontario and Orleans. That at Chitteningo is in the vicinity of the village of the same name; that at Manlius, is a mile south of Orville, on the North Seneca turnpike, and two miles southerly of the Erie canal—that at Camillus is west of Nine Mile creek, and south of the canal. The water limestone of the west, is a subordinate rock; it is found in patches and small fields, on the central formation before described. It is in horizontal layers—it is highly impregnated with quartzose matter, and contains fresh water shells. Its colours are yellowish, greyish, whitish, &c. It varies in hardness from that of compact limestone, to that of the softer marls. Fresh water limestone differs considerably in the proportion of its constituents. In some places it passes into a porous cellular sandy rock. It then contains very little carbonate of lime.

In Camillus, and other places, in and adjoining the Oneida and Seneca vale, we have observed a variety of limestone which we have named argillaceous limestone. It is compact and perforated with curvilinear holes. Its colours are blueish and greyish. It contains considerable argile, and, on exposure, readily disintegrates—it makes a rich soil. We believe it is a subordinate rock. Professor Eaton proposes to name it vermicular limestone.

The bed of Seneca river, below Jack's reef, is a soft whitish limestone for two miles. A similar rock is found in the bottom of the same river, at Baldwin's mills, in Lysander.

A variety of argillaceous limestone occurs, in very small patches, or rather in beds, in the grey wacke slate districts. It is a subordinate rock. In the Mohawk country the beds are numerous. It is disposed in horizontal layers, which vary from two to eight inches in thickness. It is divided lengthwise and crosswise, by seams or fissures that have great smoothness and regularity. The layers have considerable length, without much breadth. It has a conchoidal fracture. On exposure to the weather, it cracks.

We examined a bed on the right bank of the West Canada creek, two miles above its mouth. Some of the lower layers alternate with very thin layers of slate. The bed of the stream is a blackish slate—here the argillaceous lime rock reposes on the slate. This rock contains few organic remains.

Gypsum.

This rock is found in beds and small fields, in the counties of Madison, Onondaga, Cayuga, Seneca, Wayne, Ontario, Livingston, Orleans and Niagara. All the known localities are, we believe, within, or bordering the great limestone formation. Quarries have been opened eastwardly, as far as Oneida creek, and westwardly, as far as Grand or Ouse river, in the Province of Lower Canada. Between these two lines, the rock is sufficiently abundant.

The gypsum, under consideration, is deemed a secondary rock. In some places it is amorphous and massive, being disposed in thick layers, while in others, it is lameller and tabular, transparent, and highly beautiful. Its usual colours are greyish and blackish. It is sometimes mixed with clayey matter, of a dark colour, not unlike hardened mud.

The gypsum of Onondaga was found, on analysis, in one hundred grains, to consist of twenty-one of water, thirty-two of lime, and forty-seven of sulphuric acid—See *Med. Rep.* vol. 13, p. 77.

Gypsum is massive, earthy, tabular, lameller and crystalized. The latter is usually denominated selenite; it is of common occurrence, and is generally transparent, with a glittering lustre, and is of various hues, such as white, grey, yellow, &c. The white is the most common. It often constitutes portions of the mass, being imbedded, and is seldom found in veins. From its dissemination, it appears to be of cotemporaneous formation with the rock in which it is imbedded.

"Gypsum, of the coxcomb kind, is found on the east side of Cayuga lake, on the beach, after high winds, it having been washed from the bank where it lay imbedded. It may be procured at a distance from the shore by digging—it is transparent. The rose colour of the coxcomb, in France, is ascribed to iron." See *Thomas' Travels.*

"Crystalized sulphur, of a fine transparent yellow, has been found at Thomsons' quarry, in Cayuga county. It is imbedded in the layers, and is so plentiful that it trickles down when fires are made near the plaster." See *Thomas' Travels.*

"Gypsum is found in the fetid limestone at the falls of Niagara, evidently produced by the decomposition of pyritous, calcareous and shistic rocks. Here the newly formed sulphuric acid combines with the lime, and discharges the carbonic acid and hydrogen. When picked up at the foot of the falls in loose white lumps, it has been called petrified white foam."—Dr. *Mitchell.*

Snowy gypsum and sulphate of lime have been found at Rochester, on Genesee river.

Gypsum, on being exposed to the weather, speedily decomposes. Selenite or sulphate of lime, when subjected to a certain, degree of heat, looses its water of crystallization and is changed into fine powder.

Gypsum is extensively used as a manure, or fertilizer, in the interior and along the Hudson ; but on the coast and in the vicinity of the ocean, it is of little or no use; the saltness of the atmosphere destroying its fertilizing properties.

The gypsum of these beds and patches, contains animal and vegetable remains, but not abundantly.

The beds and patches are frequently surrounded with debris, marl, clay, &c. which are sometimes mixed with the gypseous rocks. Some of the gypsum beds and fields rest on or near the red sandstone rock, while others are on or near the limestone. It is often intermingled with the latter rock, at and near the places of contact. It not unfrequently reposes on a slaty rock containing calcareous matter, which occasionally forms roofs or coverings to the beds. The beds, however, are oftener covered with clays and other earths.

In the towns of Lenox and Sullivan, in the county of Madison, it forms rises and small hills, and is generally covered with soil. The beds are near the Erie canal. Several have been opened and extensively quarried. In Manlius, and other parts of the county of Onondaga, it is also seen in swells and small hills, now and then in ridges, which are sometimes on the very bank of the canal. On the east side of Cayuga lake, and its outlet, northerly to Montezuma, it appears in rises, ridges, &c. of very moderate elevation. Some beds have been wrought, but the gypsum, in general, is inferior to that of Onondaga and Madison. Thomas, in his travels, says, " the layers, in several of the beds, are very unequal in quality ; and that in consequence of not separating them when quarried, the reputation of the Cayuga plaster has fallen into great disrepute." The beds on the east side of the lake are between Long Point and the bridge, and occupy an extent of seven or eight miles.

In Wayne county the beds known are mostly in the towns of Galen and Lyons. They form hills, &c. The Erie canal

passes through these towns. The beds are north of the limestone formation. Gypsum has been found in the town of Junius, Seneca county, near Waterloo. In the county of Ontario, along the Canandaigua outlet or river, nine or ten miles northwest of Geneva, there are beds and patches which have been opened. They are north of the preceding limestone formation. Gypsum also occurs at East and West Bloomfield, in the same county. Gypsum likewise occurs at Caledonia, in the county of Livingston. The beds are within the great limestone formation.

Gypsum is quarried in large quantities, and sent down the Erie canal to the Hudson, and up Cayuga and Seneca lakes, to their heads, where it is transported by land to the navigable waters of the Susquehannah; from whence it is either distributed over several of our southern counties, or carried down that river into Pennsylvania, and disposed off. The demand is annually increasing. In a few years it will be an article of great consumption.

In this State the gypsum beds occur in an extent of one hundred and seventy-five miles, from east to west. In the county of Cayuga, the width of the line is about twelve miles. We are not certain whether this is the greatest or not. Many of the beds are near each other, while others are several miles apart. Again, many beds remain to be discovered, it was not till lately that gypsum was found at Lockport, in the county of Niagara.

The gypsum beds, in general, are not very thick. The rock is sometimes bare, but then this is occasioned by streams. The cover is often not over ten feet. In some instances, wells have been dug below the base of the beds, their thickness being under thirty feet.

The salt springs are situated near the gypseous beds, and sometimes among them. The saline properties of the waters are derived from deposites of salt in some of the beds, and in other beds which adjoin, surround, or blend with them. Besides the salt, the waters contain sulphates of gypsum and lime, carbonate of lime, marl, clay, &c. Salt is always found in beds

or masses, and in the crystallized state. It is seldom pure. Several countries in Europe abound in rock-salt and salt springs; as England, France, Spain, Italy, Germany, Poland, &c. In England the most important springs and mines are situated in tracts, whose geological structure bears strong analogies, to that of the tract containing our springs, gypsum beds, &c. In some places among the patches and beds of gypsum, we see depressions which have probably been occasioned by the dissolution of the salt, enclosed in the beds, and the falling in of the roofs. We have no reason to expect that fossil salt will ever be found where the springs are. The deposites of fossil salt which saturate the waters, are at some distance from the springs.

Dr. Mitchell supposes that the beds of rock-salt, which supply the salt springs of Onondaga, &c. are the derelictions of the salt ocean, which originally covered the whole of North America, or of the salt lakes that continued to cover extensive tracts after the primitive ocean had retired.

Beds of gypsum, it is probable, are forming at this time in Lake Ontario, which at some distant period, will be uncovered by the reduction of its waters. Most of the calcareous and argillaceous matters which the Niagara has transported from the ravine, between the falls and Lewistown, have been deposited in that lake where they have been precipitated.

Marls.

There are three principal kinds of marl, besides several varieties, *to wit*:—the calcareous, argillaceous and bituminous. The calcareous is very often of a pale greyish colour. The argillaceous is bluish, greyish, &c. The first contains shells, trunks of trees, &c. Marl is now forming in and around Onondaga lake, and many other places in the western country; and also in several of the counties along the Hudson. Some of the most extensive fields of marl, known in the State, are in the Oneida and Seneca vale. The Montezuma marshes, and some of the cedar swamps, might be instanced. Between

Madison and Wayne counties, much of the canal is carried through marl. The calcareous and argillaceous marls have generally an earthy texture.

The bituminous is slaty and massive. It is found mostly in the western country. Its colours are blackish, brownish and greyish.

Hitherto marls have been but little used among us in improving lands. Most of our people do not know them, and are entirely ignorant of their utility. In Europe they are extensively used as manures. The amelioration of the soil, in certain districts in England and France, is mostly owing to the use of this fertilizer.

Peat—Peat occurs in different parts of the State, but there is not much of it suitable for fuel. The Montezuma marshes, Sacondaga Fly, and some of the Cedar swamps, in the Oneida and Seneca vale, and other parts, have coverings of peat. The peat of the Cedar swamps and the Montezuma marshes, rests on marl. Its thickness varies; in some places it exceeds four feet. The peat of the Montezuma marshes may be denominated both lake and marsh peat. The forest, in general, overspreads the Cedar swamps. The mountain is found in the mountainous districts. The marine and transported are found mostly on Long Island. Some of the mountain, marine and transported, may be used as a substitute for wood and coal. The peat of the Oneida and Seneca vale, is a vegetable earth, imperfect in its decomposition. Its usual colours are brownish and blackish. It is soft, spongy and permeable, being loaded with water. These swamps, when cleared, drained and cultivated, are commonly productive. Clearing, draining and cultivation, induces a considerable reduction in the peaty covering. In droughts, the peat, in some places, if fired, will burn. The combustion is slow. In black ash swamps, where peat frequently occurs, accidental fires have been known to burn for weeks in droughts, and to consume the surface down to the soil underlaying it; prostrating at the same time all the forest trees.

The commissioners of the Erie canal, in one of their reports, inform us that the superficial stratum of the Montezuma marshes

is found to be to the depth of four feet and a-half, blackish and light vegetable earth, underlayed to below the bottom of the canal, with shell marl, occasionally interrupted with sand and vegetable matter. The canal runs eleven miles through these marshes. In the spring they are flooded. A rise of five feet in Seneca river, at the village of Montezuma, suffices to inunduate them. The rise occasionally is seven feet. At low water the surface of the stream is three feet lower than that of the marshes. The stream is highest in April, and lowest in September.

"*Jet*—Pitch coal occurs on Long Island and Staten Island. It consists mostly of carbonized or vitriolated wood." See Dr. *Mitchell's Notes appended to Phillips' Geology.*

Iron.

This highly useful mineral is found abundantly in the primitive transition and secondary districts. Hitherto, it has not been very extensively wrought, owing partly to the newness of the country, and partly to the preference given to foreign iron. Were government to encourage its manufacture by premiums, and additional duties on the imported, in a few years enough might be made, not only to supply domestic consumption, but for exportation. The New Tariff, should it be continued, will give stimulous to the exertions of those engaged in the fabrication of this most useful of all the metals. In this article we shall do little more than name the localities already known.

Iron occurs at Chesterfield, Moriah, Wilmington, Elba, &c. in the county of Essex; at Peru, &c. in the county of Clinton; at Canton, Rossie, &c. in the county of St. Lawrence; at Hope, &c. in the county of Hamilton; at Wilna, in the county of Jefferson; at Westmoreland, &c. in the county of Oneida; at Burlington, &c. in the county of Otsego; at Munro, &c. in the county of Rockland; at Pawling, &c. in the county of Dutchess; at Phillip'stown, &c. in the county of Putnam; also, in the counties of Orange, Ulster, Lewis, Montgomery, Warren, Washington, Tioga, &c. &c. The ore intended to

be designated, is in beds and veins, and is usually very rich. The beds and veins in the counties of Essex and Clinton, which have been opened, are very productive, yielding from forty to eighty per cent.

The iron ore which occurs near the Erie canal, in the counties of Herkimer, Oneida, Madison, Onondaga, Wayne, &c. is argillaceous oxide of iron, or clay iron stone. It is in great profusion, and often very rich. Several beds have been opened and are now extensively worked. These beds, in general, may be pronounced inexhaustible. The ore is adapted to castings, such as kettles, stoves, cannon, &c. rather than for bar iron. In the counties of Herkimer, Oneida and Madison, pots, kettles and stoves are made to an extent far beyond the demand in those counties.

Bog ore occurs in the plains of Saratoga, Albany, Schenectady, Oneida, &c. The same kind of ore also occurs in the counties of Lewis, Jefferson, St. Lawrence, Franklin, Clinton, Essex, Warren, Hamilton, Montgomery, &c., and pretty generally speaking, wherever there are plains of sand: but a bare enumeration of the places would be irksome to the reader in a work of this kind. The rock or mountain ore is, however, in greater abundance, and is more widely distributed, especially in the tracts called primitive. It is also the best; it is not only adapted to castings, but also to bar iron. The beds and veins are often in mountains and hills. The bog ore is found in swamps, marshes and bogs, and consist of three kinds, meadow, swamp and marsh. These occur in every county in the State, but not in the same abundance. The primitive and transition districts, or such counties as are situated wholly, or in part in them, have most. Bog iron ore is of various hues, such as black, brown, &c. and is generally of a softish earthy texture.

Dr. Mitchell is of opinion, that the bog iron ore, found at New-York, in the alluvions, was brought down partly from the interior, by water, when the barriers which confined the inland seas gave way, and partly by the chalybeate springs, and oozing of water trickling over the soil and deposited.

Formation of bog iron ore—This mineral, according to naturalists, is formed generally of iron ore which had previously existed in rocks. The water, say they, which runs over rocks containing iron ore, takes up portions, which combining with it, are afterwards deposited in swamps, marshes, ponds and lakes where they appear in the form of hydrate of iron. Iron ore, as well as iron, when exposed to the weather, oxydates or rusts, and the oxydation or rust which is carried away by the water, is deposited anew. It is said that in Sweden, where the primitive rocks are highly charged with iron ore, that the bog ore is found in great abundance in the bottoms of shoal ponds and lakes, and so rich as to yield sixty per cent of hydrate of iron. The ore, in consequence of the copious deposites and rapid renewals, is in some instances, dredged out every ten, and in others, every twenty or thirty years. Bog iron ore, in many places in this State, renews every ten or twenty years; in others, it is said never to be renewed. In the latter instances, it is presumable that the ore was originally brought from a distance by an agent, which no longer exists.

Bog iron ore, we are assured by Mr. Joel Northrup, of Taberg, in the county of Oneida, renews in the plain northwest of the village of Rome, in the same county, in nine or ten years. The ore is found in these plains, in the swampy, marshy and boggy places, from the size of a grain of wheat or less, to that of a man's head. The plain is five or six miles in length, and three or four in breadth.

Magnetic iron ore occurs in the Highlands, or Matteawan mountains, near the Military Academy at West Point, in the primitive rocks.—Dr. *Mitchell.* The same kind of ore occurs in the northern primitive tract.

Red Iron ore—Iron Glance—According to Dr. Mitchell, pieces of this ore are frequently picked up along the coast of New-York. They are soft enough to be employed by the millers to mark their barrels of flour. He supposes that they must have been washed from the interior, where iron ore abounds to the coast, where we find them, by the volume and force of the

the water that broke the barriers and covered the alluvion of the ocean, with another and more recent alluvion, from behind the mountains.

Brown Iron ore—A compact variety of this ore, denominated *brown hematites*, containing encrivites and shells, apparently oceanic, has been found in Oneida county. See Dr. *Mitchell's Notes to Phillips' Geology.*

Black Iron ore—Dr. Mitchell imagines that the beautiful fibrous iron ore, worked at Ancram, in the county of Dutchess, whose crystals radiate from the centre to the circumference, is a variety of this species. He observes that lumps occur in the inland alluvions of Staten Island.

Clay Iron stone—Argillaceous stone—Argillaceous Iron ore—This mineral occurs in many places along the sea coast, and shores of New-York, in the form of globular and roundish masses, which, on being broken, are found to contain a kernel of softer matter, usually ochreous, resembling the yelk of an egg within the shell.—Dr. *Mitchell's Notes to Phillips' Geology.*

Granular iron ore is of common occurrence in the Highlands, or Matteawan mountains. The masses are about the size of peas, and the spaces are generally filled by quartz. The constitution of the ore is very compact.—Dr. *Mitchell.*

The argillaceous iron ore, found in the county of Oneida, may be called clay iron stone. It is brownish, or reddish brown, and when rich saponaceous to the touch. Its structure is slaty, or inclining thereto. This ore has been used as a substitute for Spanish brown.

Manganese—Black oxide of manganese, in combination with iron, has been found at Ancram, in the county of Dutchess. See *Medical Rep.* vol. 11. p. 442, 3. According to geologists manganese is very rarely found in the metallic state. A mixed ore, consisting of the oxide of manganese, oxide of iron, and carbonate of iron occurs in various parts of Rensellaer, Columbia and Schoharie counties.

Molybdena—Sulphuret of molybdena occurs frequently in

the primitive rocks of New-York. It is foliated, shining and flexible, and imparts a stain like black lead. See *Notes of Dr. Mitchell to Phillips' Geology.*

Titanium—This metal has been found in Manhattan Island, in the primitive limestone, near King's bridge; also at Ticonderoga, in the county of Essex; around Lake George, in the counties of Washington and Warren; at Peekskill, in the county of Putnam; on Staten Island, &c.

Copper—Native copper has been found in Staten Island; at the Narrows, between that Island and Long Island; in the alluvions between the city of New-York and the ocean.—Dr. *Mitchell's Notes*, &c.

Copper has also been found in veins and beds in the counties of Essex and Dutchess, but not in large quantities.

Sulphuret of Copper—Glance copper is found in the red sandstone formation, in the county of Rockland, accompanied with the oxide and carbonate of copper. See *Notes of Dr. Mitchell to Phillips' Geology.*

Silver—Native silver occurs at Sing Sing, in the county of Westchester, in this State, but not in considerable quantity.—Dr. *Mitchell.* See *Med. Rep.* v. 6, p. 319. It would be hazardous to express an opinion, in relation to the paucity or abundance of this metal in the State, as the mineral kingdom is as yet very little explored. The rich mines of Saxony, Transylvania, &c. in Europe, were not known to the ancients. Silver mines of great richness, may, for aught we know, be entombed in the earth. Discoveries are often the result of accident. The discovery of the mines at Potosi, in South America, was owing to such a circumstance.

Galena—Sulphuret of lead has been found in the counties of Ulster, Dutchess, Columbia, Rensellaer, Washington, Montgomery, Herkimer, Essex and Clinton, in slate, limestone, and other rocks. The beds and veins do not yield this mineral in large quantities—it would be unsafe to give an opinion in relation to the abundance, as none of the mines have been opened and worked to any extent.

Zinc, Blend—Sulphuret of zinc has occurred in the lead mines at Rochester, in the county of Ulster. It has been found, as Dr. James Hadley, Professor of Chemistry, in the Medical College at Fairfield, in the county of Herkimer, has assured me, at Salisbury, in the same county. Zinc has likewise been found in the county of Dutchess.

Tin—This metal has been found in small quantities in the county of Dutchess.

Antimony—This metal is known to exist in the county of Ulster.

Arsenic—Arsenic, in the form called white pyrites, is occasionally found adhering to quartz, in some of the primitive rocks. Some specimens from Warwick, in the county of Orange, are in roundish lumps or balls, of different magnitudes, from that of a man's fist, to that of a moderate sized melon—externally the lumps or masses are rough and tarnished, but within, they exhibit a tin coloured lustre. They are very heavy and readily emit garlick, flavoured vapours, of a white colour, by exposure to a moderate degree of heat. See *Notes to Phillips' Geol. by Dr. Mitchell.* The same naturalist denominates the above, mispickle, or arsenical pyrites.

Iron Pyrites, sulphuret of iron—This mineral occurs in all the rocks from the oldest to the youngest. It is in masses, paralelopipeds, cubes, balls, &c. Its colours are bright yellow, pale yellow, brown, steel grey, tin white, &c. The bright yellow has often been mistaken, by the common people, for gold. Miners, and those in whose hands mineral rods have self-motion, would do well before they spend much time and money in digging, to subject it to a chemical test. Pulverization and ignition will be sufficient, as this glittering mineral, when triturated, burns nearly as quick as powder.

In some cases the forms of pyrites are durable, while in others, they decompose and fall to pieces. Pyrites sometimes penetrates wood which has been buried for a long time. "Mineralized wood has often been dug up on Long Island and Staten Island.—Dr. *Mitchell.* Pyrites occasionally contains both sulphur and arsenic.

Pyrites is largely employed in the fabrication of green vitriol, &c.

Sulphur—This mineral occurs at Phelps, in the county of Ontario, and various other places. Hitherto it has not been manufactured to any extent. Sulphur, it is said, abounds in the mineral, vegetable and animal realms.

Soils, &c.

In this article, we shall endeavour to give a synopsis of the soils. Beyond this little can be expected, in a work of this kind, however desirable it may be. We intend to arrange them under seven heads:—First, clay,—second, loam—third, sand—fourth, gravel—fifth, alluvion—sixth, marl—seventh, peat, or vegetable earth. These are divided into kinds and varieties.

1. CLAY *kinds.*

Yellow	Grey
Blue	Red.
White	

These exhibit varieties. The yellow, grey and red are the most common.

2. LOAM *kinds.*

Argillaceous	Calcareous
Silicious, or quartzose	Gravelly.

The argillaceous and sandy are the most widely distributed. Upland and lowland loams, together with friable, come under the foregoing denominations.

3. SAND *kinds.*

Grey	Yellow
Reddish	Brown
Black	White.

These never occur in a perfectly pure state on the surface, being always mixed with some of the other earths. Iron often gives colour to sand. The black, the brown and ferruginous, derive their colour from this mineral. Iron is a very abundant mineral—it gives colours, not only to several soils, but also to rocks.

4. GRAVEL *kinds.*

Fine	Coarse
Loamy	Sandy
Calcareous	Argillaceous.

Gravelly soils, although of common occurrence, are less abundant than the preceding. In some instances, they are productive.

5. ALLUVION *kinds.*

River	Lake.
Vegetable	

The varieties are argillaceous, sandy, calcareous, gravelly, &c. These denominations seem applicable, according to the prevalence of the argillaceous, quartzose, calcareous, gravelly and vegetable matter.

6. MARL *kinds.*

Argillaceous	Bituminous
Slaty	Calcareous
Sandy, or quartzose.	

Marl may be ranked among the newer earths—it is a valuable manure—it differs in constituents, colour, and other circumstances. The names used denote the kinds. In the argillaceous, the clay predominates. The bituminous and slaty may be denominated argillaceous. In the calcareous, lime is the main ingredient, as sand is in the quartzose. Clay or lime, however, is the fertilizer in the latter. The colours are whitish, pale yellow, yellow, grey, blue, green and blackish. Marls may be divided into two classes, ancient and recent. The former was formed while the primeval ocean was abandoning the surface of the earth—the latter, after the abandonment, and while extensive tracts were still covered by the derelictions of the primitive ocean, or the lakes left by those derelictions. The Oneida and Seneca vale, at this day, affords many examples. The marls of the Montezuma marshes, and the cedar swamps, have been formed since, and while the vale was the bottom of a lake, or the derelictions of a lake. Around Onondaga, and some other, collections of water marl is still forming.

7. PEAT, or vegetable earth—*kinds.*

Swampy Marshy.
Boggy

Peat, or vegetable earth, varies considerably in age, colour, constituents, and other circumstances. The bituminous, or such as is charged with bitumen, is used for fuel. There is not, however, much of this kind in the State. The others, when dried, will burn, but the combustion is slow and irregular. Some of the peaty soils are fertile. This is the case generally wherever the lands can be drained.

We shall conclude this chapter with some remarks.

It has been alleged by some writers, that soils partake of the nature of the rocks which support them. This, in a qualified sense, is true; but when applied to the soils of all countries, it is not. The plains of the Hudson, and some other districts in this State, are exceptions. These are alluvial. They have, however, not been formed by rivers and creeks, or the disintegration of rocks in place, but by some great inundation which removed the soils from one region to another. We intend to confine our remarks mostly to the Saratoga and Albany plains. The inundation, or deluge, which transported the soils of these plains from *situ*, to where they now are, we are of opinion was not universal or of long duration, but limited and transient. It did not cover the highest hills and mountains in this State. Its direction seems to have been from the north to the south. The Saratoga and Albany plains have a direction from north to south, and are between sixty and seventy miles in length, with a breadth of from two to twelve or fourteen miles. The rocks underlaying these plains are mostly clay slate and grey wacke slate. There are two slopes, one southerly and the other towards the Hudson. The former is very easy; the latter is usually so. The ancient soils, or such as were formed from the disintegration of rocks in place, were mostly left, although invaded and covered by those deported. The deported soils consist of gravel, sand and sandy loams, and now and then of some clays which are always distinguish-

able. The gravel is the most abundant in the north; the sand in the middle, and the sandy loams in the south and on the margins. The gravel, sand and loams vary in thickness from four to sixty feet, exclusive of some hillocks and ridges. The surface of the three contains more or less clay. Beneath sand and gravel are found in greater purity. The former is often nearly pure, indicating a subsidance, and levelling in accordance with its specific weight or gravity. The sand and gravel, and even the loams of these plains agree in their component parts with the sand, gravel and loam, found in the northern primitive tract. No rocks in *situ*, that is such as underlay the plains, could by disintegration have formed such soils. Hence, we are led to conclude that the soils enumerated, or such as constitute the plains, were deported by a transient inundation, and spread over the original soils, or such as belonged to them as were left by that inundation. The gravel, sand and loam rest upon the clay, marl and rocks in *situ*. The line of the Hudson was the centre, or nearly so, of the inundation. Along its line the waters of the deluge moved with most force. Here the strongest and most durable traces have been left. The sandy and gravelly swells and ridges lessen as we recede from the vicinity of the stream. Fewer traces are to be seen on the east side than on the west side of the river. But this was occasioned by the county being more elevated on the east side. The conformation of the Kinderhook plains, however, in some respects, demonstrates that the invasion would have left sameness of aspect, and other circumstances, had the county been equally level on both sides of the river when it was invaded.

Before this inundation, we think that this part of our hemisphere produced, nourished and supported the mastodon. The bones of this enormous animal have been found in the low grounds of the counties of Ulster and Orange, buried beneath the recent alluvions. Here then we have evidence that this animal once existed. Here then it was enveloped by the last, or one of the last catastrophies which befel our globe: We mean an inundation or deluge, which did not rise to the height of the highest hills and mountains, because the lesser animals,

whose bones are found enveloped in similar alluvions, still exist. The inundation, or deluge, did not cover the whole earth, but only the lower parts. It only destroyed the animals that dwelt in the lower parts, or such as it found. The mastodon, or American elephant, as it is called by some, dwelt, it is probable, in low situations The deluge, then moving over these places, overwhelmed and obliterated the race. To such, or a like catastrophe, we must attribute the destruction of this race of animals. Our globe has been the theatre of great revolutions. Whole races of animals have been swept away. Rocks and alluvions, in which their remains are entombed, it would seem, proclaim these truths.

The bolders, or blocks of primitive rocks so plentifully scattered over some districts, lying in the transition and secondary tracts, were, it is likely, brought by the same inundation or deluge, or one or others which preceded it. These bolders attest the force of the inundation, or the rapidity and volume of the overwhelming waters. The waters must have moved in vast torrents, and with great velocity, otherwise they could not have removed and transported these masses, many of which are of enormous size, from *situ* to the places where they are now found. The counties of Saratoga, Montgomery, Herkimer, Oneida, Lewis, &c. afford immense numbers of these bolders. They are not wanting in the counties of Schenectady, Schoharie and Otsego, but in the two latter they are not abundant. The numbers and sizes lessen as we leave the primitive region which furnished them. These bolders are now in lines, and then strewed; occasionally they are heaped. The plains, slopes and acclivities where they now lie, are sometimes gradual, and at others steep. In ascents, we now and then find that the bolders were arrested. The hills on the south side of the Mohawk, and of Lake Ontario, seem from their acclivity, to have stayed most of them. This is particularly the case in the Mohawk country, Hassencleaver, and some parts of the Highlands of Black river. We find them on the north side of the Mohawk, along the valley, and on the first series of hills on the south side of that river: on the north side of Hassencleaver

and on the Highlands, but very few southerly of these limits. They cover the ground, in a few places, on the declivities and acclivities, and even in the valleys. They are all out of place, and based on the newer rocks or alluvia. The largest bolders we remember ever to have seen, are on the north side of the Mohawk river, and on the Highlands of Black river, and its declivities. Some which lie on the summit of the Highlands, which, in certain places, is a kind of plain, are of enormous magnitudes, containing from 2,000 to 5,000 cubic feet. On descending the Highlands, in the direction of Utica, the numbers and magnitudes diminish. The northern acclivity of Hassencleaver seems to have lessened the strength of the torrents, and caused a detention of the bolders. Very few are now found on that mountain. Between its foot and the hills of Otsego and Chenango, only solitary ones of small dimensions occur. Blocks of primitive rocks are to be seen along the West Canada creek, almost to its mouth. Those found near the river are smaller than those at a distance.

The bolders, whether primitive, transition or secondary, are smaller now than they were when removed from their original positions. On the Highlands of Black river, and some other places, where they rest on the limestone, the rocks supporting them, in certain instances, form bases all around them; the rocks beyond the bolders having passed away by disintegration since the deportation.

In the county of Oneida, northwesterly of the village of Rome, there is a sandy plain which appears to have been formed in the same way that the Albany and Saratoga plains were; that is, by the deportation of sand, gravel and loam, from the primitive region, lying to the northeast. Its extent is four or five miles in one direction, and two or three in the other. The aspect of these plains is similar to that of the Saratoga and Albany. The depth of the sand and gravel composing them, is inconsiderable. Bog iron ore occurs in the swampy and marshy places. The gravelly plain on which the village of Rome stands, it is probable, is foreign, having been brought by the same or a similar agent. The deported stratum has a thick-

ness in some places of thirty feet. Trunks of trees have been found buried at the depth of twenty feet.

On the north side of the Mohawk, in the counties of Herkimer and Montgomery, patches of loam, sand and gravel, of foreign origin, often occur. Along West Canada creek, they may be found as far as the Mohawk. The village of Herkimer stands on one of these patches. The river alluvions encircle it. Traces may be seen on the south side of the flats, to Fall Hill. East of the village of Herkimer, immediately after crossing West Canada creek, there is a plain containing some thousand acres, the soil of which is evidently deported. Here gravels and sandy loams form the cover.

On the southeasterly side of Mayfield mountain, or Clip hill, in the county of Montgomery, there are patches and small fields. Those in Johnstown and Broadalbin are the most considerable. In the towns of Cicero and Lysander, in the county of Onondaga, there are two small plains.

Between Camillus, in the county of Onondaga, and Cayuga lake, and southerly of the Erie canal, there are many small ridges and hills composed of gravel and loam. They are based on a plain, and occupy a line from two to four or five miles in breadth. They are insulated, and are formed of materials differing from those of the plain on which they stand.

The plain between Waterloo, in the county of Seneca, and Geneva, in the county of Ontario, is mostly a sandy loam. Its aspect differs from that of the lands around.

CHAPTER XII.

CLIMATE.

THE climate of a country is modified by various causes and circumstances, such, for example, as its latitude, its surface, its aspect, its waters, its winds, its cultivation, and its soils.

That portion of the American continent, lying in the parallels of Europe, has been found several degrees colder in winter. In this State, which corresponds with the north of Spain, the south of France, and the centre of Italy, there is usually enough of snow every winter for sleighing, from four to twelve weeks, some small tracts excepted.

The thermometer varies from the freezing point, which is thirty-two degrees to zero, and from thence to fourteen degrees below. In some instances it has been known to descend to twenty-six degrees below zero. The comparative tables of Dr. Beck, kept at Albany, from the first of January 1820, to the first of January 1827, comprising seven years, show the lowest ranges below zero, to have been twelve and fourteen degrees. These instances are, however, at present rare, and are therefore considered extraordinary. Sixty or seventy years ago they occurred almost every year, differing only some degrees in severity.

Sometimes on the coast of the Atlantic ocean, and along the basins of the Hudson and St. Lawrence, there are thaws in winter, which raise the mercury to sixty, and even to seventy degrees, which is summer heat. These thaws accompany and follow the southwest wind, which occasionally blows on the sea coast, and in these basins. The same wind is not unfrequent in the basin of the Susquehannah. The southwest wind sometimes becomes southerly, adapting its course to the valleys which it traverses—but more of this hereafter.

The snow does not continue so long along the river St. Lawrence, and its vicinity, as it does in the forests, by a month or five weeks. The winter (that is permanent snow) does not come on so soon by a month or five weeks. The winters along this river are more broken and less severe, since improvements have been made, than they were before.

The winters along the shores of lakes Ontario and Erie, and on the river Niagara, which connects those lakes, are usually from two to three weeks shorter in their duration than they are along the St. Lawrence.

In the counties of Steuben, Alleghany and Cattaraugus, and the upper parts of Chatauque county, the winters usually commence a month earlier than they do on the coasts of Lake Erie, and in the champaign and flat countries around it; and this, notwithstanding these counties are on the same parallel with a part of this lake. We speak only of snows which remain after they fall, although the same remarks will, in a measure, apply, when the winters are mild or even severe.

The difference between the climate along the St. Lawrence, around lakes Ontario and Erie, and along the Niagara, and that of the forests in the interior, and even in the cleared parts, is very marked, independent of elevation, as every observer must have noticed.

The intense heats begin about the first of June, and continue to the middle or last of August. During this period the thermometer generally fluctuates between seventy and eighty-five degrees of Farenheite. Sometimes the mercury ascends to ninety-five, and even as high as one hundred degrees, while at others, it descends to sixty or sixty-five, and even as low as forty-five, which is within thirteen degrees of the freezing point.

The greatest heats are in July; almost every year, there are several days in succession, in which the mercury rises from seventy-five or eighty degrees, to ninety or ninety-five degrees. The maximum is between one and three in the afternoon, and the minimum, between one and four in the morning. The severe cold begins about the winter solstice, and continues with more or less severity, to the middle or latter end of February,

the period usually being about two months. Sometimes, however, these colds hold over till in March. Formerly, they lasted to the middle, and even to April. This is still the case in the forest between the Mohawk and St. Lawrence rivers, out of the clearings.

The heats, in April and May, are sometimes intense, the thermometer being between ten in the forenoon and four in the afternoon, seventy or seventy-five, and in certain instances, eighty degrees. A similar intensity of heat often prevails between the first of September, and the autumnal equinox; and even as late as the first of October, it is not uncommon to see the thermometer at seventy or seventy-five degrees, between the hours of ten in the morning and four in the afternoon.

Severe cold is sometimes witnessed as early as the middle or latter part of November, and the forepart of December, and as late as the latter part of March, and the forepart of April.

The cold, between the winter solstice and the latter part of February, is ordinarily so very great as to freeze the Hudson, and our other rivers over in twenty-four or thirty hours, strong enough to bear footmen and horsemen. These occurrences are, however, becoming rarer than formerly, particularly along the Hudson, and some other rivers, where large clearings have been made.

The variations in the weather during the winter, are often very sudden and extremely great, amounting, in some instances, to forty or fifty degrees in twelve or twenty-four hours. In spring, summer aud autumn the changes are no less sudden and great. Frequently there will be a decrement in the thermometer from eighty or seventy, down to sixty or fifty degrees; and there are not instances wanting of its descending forty degrees in less than twenty-four hours. These cases commonly occur when the wind shifts to the northwest or northeast and blows from those quarters.

These examples, or instances, are, however, yearly lessening, as the forests are falling beneath the axe. The northwest and northeast winds are less frequent, less violent, and of less duration than heretofore.

There are very marked differences between the climate below the Highlands, or Matteawan mountains, and that above them, and between the latter and that in the north, the east, the interior, and the west. The climate along the basin of the Hudson proper, and along Lake Champlain, varies very considerably from that of the south, the interior, and the west. There is also a variance between the first and the last. We shall, in due season, introduce some facts independant of thermometrical observations, and even the presence and absence of snow, to show the differences.

From some of the preceding data, it will be seen that the scale of variation, in summer, is from thirty-five to sixty degrees; in autumn, from sixty to seventy-three; in winter, from seventy to ninety-six; and in spring, from three to seventy-five. These are the extremes. In summer, instances happen of the mercury descending from seventy, which is summer heat, to forty, and of its ascending from seventy to ninety or one hundred. In autumn it will now and then rise from forty to forty-five above the freezing point, which is thirty-two, and it will fall from twenty to twenty-eight below. In winter, it will run down to three, six, fourteen, and even twenty-six degrees below zero, and rise seventy above; in spring, it will be as low as three above zero, and as high as seventy-five or eighty above.

The variations are greater on the Atlantic coast, and along the St. Lawrence, and around lakes Ontario and Erie, than they are in the interior, independant of elevation and improvements, because the northeast, east, southeast and southwest winds are more prevalent on the coast, and the southwest and northeast on those lakes, and along the St. Lawrence. The northeast is cold and tempestuous, bearing on its wings snow or rain; the east is wet and cold, sometimes snowy. At New-York, the northeast and east frequently bring snow; the southeast is sometimes attended with snow. The south and southwest winds are hot and often stormy. On the coast, and in the basin of the Hudson proper, the southeast, south and southwest winds, especially the latter, sweeps away most or all of the snow. The south wind of the Hudson is usu-

ally, in its inception, a southwest wind, but then on its entering the basin of that river it changes its direction, adapting its course to the basin's configuration. Winds often conform themselves to the course of river valleys, &c. The southwest, in like manner, dissipates the snow in the St. Lawrence basin, and the basins of the great lakes, lying in its range. But these winds, after all, do not commonly have great effect out of those basins, being generally confined to them. The southwest wind, after it has entered the basin of the Hudson, becomes a south wind. It advances northerly as far as Lower Canada. Its strength diminishes as it marches onward.

The transitions from cold to heat take place with the changes of the wind from northwest or northeast; sometimes from the east to the southeast, south or southwest; and on the contrary, from heat to cold occur with changes of the wind from southwest, southeast to northwest, northeast and east. The physiognomy of a country has great influence in forming winds and currents. This is particularly the case with the State of New-York. The coast and the basins of the Hudson and the St. Lawrence, from their very configurations, are adapted to certain winds.

The three habitual winds are the northwest, the northeast and southwest. The first and second are general—the third is nearly so. The first and third are the most common. The south, southeast and west are local. The east wind is general, but it seldom blows. The south and southeast are confined, in a great measure, to the Atlantic coast, and inland to the Matteawan mountains.

Besides these winds, there are local winds that blow in particular districts. The north wind is local. It is confined mostly to the Champlain and Hudson valleys, and the basin of Lake Ontario. In the Mohawk valley, between the mouth of Schoharie creek and the town of Utica, the south wind of the Hudson becomes easterly and looses most of its heat.

The air in the forests which are situated in the north and west, is drier in winter and weter in summer than it is in the improved country. It is also drier in the hilly than in the flat

country, whether the lands are cleared or not. The continuance of the snow in winter is one principle cause. The cold dense air of the forests repels the warmer, rarer, and moister air of the open country. Hence there is not much mixing. The cold frozen air of the forests, however, descends in greater or less quantities into the clearings, which renders the air of those parts colder than it would otherwise be.

The snows, as we have already remarked, come on earlier and go off later in the forests than they do in the improvements. They also come on earlier and go off later on the hills and other elevated places in the improvements, than in the plains and valleys. The difference, in both instances, is striking. The snow likewise disappears sooner on southern and south-eastern aspects than it does on northern and nortwestern. The difference in elevation is sometimes modified by winds and waters, and perhaps by the soils. That portion of the western country, between Oneida creek, Niagara river and Lake Erie, and between Lake Ontario and the Chatauque and Alleghany hills, affords a luminous example, notwithstanding it has an elevation of from four to eight hundred feet above the ocean. The southwest wind, the lakes and soil, occasion the difference. The peach tree grows in all the country comprised within the above limits; and in many parts, particularly between Cayuga lake and Niagara river, attains a perfection not to be found on Long and Staten Islands, which are in the Atlantic ocean two degrees southerly. The black walnut grows spontaneously along Genesee and Niagara rivers, and intermediate, and along Lake Erie. The sassafras, which is little more than a shrub, in the east, the north and the interior, acquires the magnitude of a tree. Several other trees grow spontaneously in this district, which do not elsewhere. Many of the forest trees grow to a much larger size. The elm, the oak, chesnut, whitewood, button wood, &c. present fine instances.

The difference in vegetation, between the eastern and western parts of the State, amounts to eight or ten days, and this in favour of the latter. The same difference holds throughout the season. Wheat, rye, corn, and all kinds of grain, are

harvested before they are in the Mohawk country, and even than they are in the basin of the Hudson, in the same parallels. Frosts usually begin later in fall, and have less severity. The forest trees are clothed a longer time with verdure.

The peach tree, which thrives and obtains so much perfection in some portions of the western country, is debilitated and sickly in the same parallels along the Hudson, and does not do well. In the Mohawk country, lying between the former and the latter, it seldom bears any fruit. The severity of the weather commonly kills the young shoots—the tree languishes, becomes consumptive, and ultimately dies.

In autumn there are usually several great movements in the atmosphere, which serve as so many precursors of the approach of winter. The first happens about the time of the equinox, and is often attended with heavy wind and more or less rain. It is now and then violent on the Atlantic coast, and on lakes Erie and Ontario. This is succeeded by fine weather, which lasts with some interruptions, till about the tenth or twentieth of October, when the second occurs. This, like the preceding, is accompanied by wind and rain. There is, however, considerable difference. The winds are often very violent, and come very near to hurricanes, especially on Lake Erie. Here the winds are southwest, northeast and northwest. The two latter have commonly to yield to the first. The southwest and northeast are opposed the one against the other; the northwest is the antagonist of both. Coming from an opposite quarter, it combats these rivals, and increases the confusion. The southwest and northeast blow along the coast of the ocean, with less fury. The southeast sometimes comes in and partakes. These winds sometimes occasion the loss of vessels both on the coast and the lakes. On Lake Erie the wind will shift to every point of the compass in an hour or two. These winds rarely last over two or three days. They are followed by cold of some days duration, when the weather settles down and becomes fine. The Indian Summer, a series of smoky days, usually follows or comes shortly after the settlement. Its continu-

ance is now and then two weeks. The Indian Summer, at present, is shorter, and comes later than formerly.

A third begins the middle or latter part of November. It is less windy, but generally more rainy. Sometimes it is snowy. The cold is more intense than it is in the foregoing, and lasts longer. Instances have not been wanting of winter setting in with it, and lasting till the following April.

The fourth usually begins about the middle or towards the latter end of December, when winter assumes her empire.

We shall, in the next place, notice certain movements which occur every winter and spring. Generally in January, between the eighth and twentieth, there is a heavy thaw, accompanied with southwest wind and rain, and sometimes with thunder and lightening. In the basin of the Hudson, the southwest becomes a south wind. The southwest wind prevails mostly in the basins of the Hudson and St. Lawrence; it, however, not unfrequently pervades the greater part of the State. Portions of the southwest wind, at times, enter the valley of the Mohawk, on the Hudson and St. Lawrence sides, and meet at Fall Hill, Anthony's Nose, or some other place, while at others a current extends westwardly or eastwardly throughout the whole. This thaw lasts from two to four days, and carries off most of the snow in the vicinity of the Hudson, and the neighbourhood of the lakes. In the Mohawk and Susquehannah countries its influence is less It weakens as it recedes from the lines of the grand ærial torrents, which are the Hudson and the basins of the great lakes.

A second thaw ensues, which is less violent, between the tenth and twenty-fifth of February. Its continuance is two or three days. It is not uncommon to have two or three thaws in each of the latter months. Formerly, before large clearings were made, there was rarely over one thaw in each month. These occurred every year. The inhabitants remarked them on account of their constant recurrence. The one they called the January, and the other the February, thaw. Latterly they have been less noticed, in consequence of the frequent thaws in those months.

The third thaw commonly takes place between the tenth and twentieth of March, and like the preceding, is attended with southwest wind, rain, and sometimes thunder. Its action is confined mostly to the Hudson and St. Lawrence basins, with this difference, that its sphere is enlarged. This thaw and storm might be called that of the vernal equinox. These thaws, as we shall hereafter show, have but little effect on the snows within the forests; seldom occasioning much diminution in the quantities, or causing the streams to break up.

A fourth begins between the first and tenth of April, and lasts some days. This is usually succeeded by fair weather, which commonly holds on to the last of the month. On such occasions, it induces the trees to put forth their foilage. Its continuance is longer in the basins of the Hudson and St. Lawrence than it is in the interior. On the cessation of this weather, rains ensue. With us May is more wet and rainy than April. Frosts generally cease the latter part of May, and commence about the twentieth of September. The frosts are latest in spring, and earliest in fall, on the highest lands. The contrary happens on the lowest lands, and along rivers and lakes. In some river valleys, fogs retard and protract frosts. To these rules, there are, however, some exceptions. In elevated situations the winds occasionally prevent frosts by driving away the vapors, and disturbing the repose of the atmosphere. Frosts now and then occur early in low moist places which are remote from rivers and lakes, where the vapors exhaled in the course of the day, or during the night, are not sufficiently copious to produce fogs, or where the superior stratum of frozen air is too high to condense the vapors.

The weather in the interior is more settled and steady than it is on the Atlantic coast, and around lakes Ontario and Erie. The snows are more copious and more lasting, and the colds more equable. Uniformity of temperature, although it have more intensity, is not so affecting to the body as sudden transitions from cold to heat, and *vice versa*.

A remarkable change ensues upon clearing the lands. The weather becomes more unsteady and unsettled, but in the main,

milder. The snows come on later and go off earlier in the spring. This has happened in all those parts of the State where improvements have been made, and seems to be induced by the warmth which the sun communicates to the ground, and by the introduction of streams of warm air. The clearing of swamps, and the dissipation of standing waters also have an agency. Local winds are established. The warmth which the sun communicates to the earth, is imparted in autumn to the air. This warmth keeps up a higher temperature in the atmosphere, and prolongs warm weather. The earth, while this is going on, still receives acquisitions from the sun, so that there is a furtherance given to the imparting of warmth. These communications are in the clearings, and every day the sun shines, unless the ground be frozen and covered with snow.

The change of climate, within the memory of many persons now living, has been very considerable. The rivers, creeks and lakes do not freeze over so soon as they did formerly; nor do they remain closed so long in the spring. The ice is no longer so thick and strong. This change has taken place every where within the State where improvements have been made; the rivers and lakes do not freeze so soon, nor so thick as they did when the first settlements were made. But this change in the climate has not been confined to the State of New-York. Canada, New England, New Jersey and Pennsylvania have had their changes, and from the same causes. We shall introduce some facts in relation to these changes, which, although not exactly in place, may not be deemed irrelevant. "The Delaware, at Philadelphia, about the time (which was in the year 1681) when Penn founded the colony of Pennsylvania, was commonly covered with ice about the last of November." It is not now usual for it to be covered with ice until the first week in January.

"As long ago as the year 1749, the ancient people of Quebec, in Lower Canada, informed Mr. Kalm, a Swedish traveller, that the winters in that country were formerly much colder than they were then."

Mr. Williams, the historian of Vermont, has collected a multitude of facts, some of which we beg leave to introduce.

"Although, says he, the general effect has been every where apparent, it is not an easy thing to ascertain the degree to which the temperature has changed in any particular place. When our ancestors first came to America, thermometers were not invented, and they have not left us any accurate meteorological remarks or observations from which we can determine the exact degree of cold which prevailed in their time. Upon looking over the most ancient writers of New England, the only account I have found, which will afford any distinct information upon this subject, is the following passage, referring to years previous to 1633."

"The extremity of this cold weather lasteth but for two months or ten weeks, beginning in December, and breaking up the tenth day of February, old stile, (21st new stile,) which hath become a passage very remarkable, that for ten or a dozen of years, the weather hath held himself to his day, unlocking his icy bays and rivers, which are never frozen over again the same year, except there be some small frost, until the middle of March." *Woods' Prospect*, p. 4, Mr. Williams, then observes, that the winter is less severe now, in several respects. "That the extremity of the cold weather does not come on so soon by several weeks—that the bays at Boston, instead of being annually covered with ice, are seldom frozen to this degree—and that they do not continue in this State a longer time than eight or ten days." "That in the year 1782, the harbour between Boston and Charlestown, was frozen to such a degree, that horses and sleighs passed over the ice five or six days. That this was the beginning of such an effect as that which is mentioned in the ancient account. That the ice became fixed on February tenth. That, during that time, he found the lowest degree of Farenheit's thermometer to be nine degrees, and the greatest degree twenty-eight." He then observes "that the freezing of the bays and rivers, which Wood speaks of, could not have been under a less degree of cold. That from a series of meteorological observations which he made at Cambridge, between 1780 and 1788, he concludes, that if Woods' account be admitted, there must have been a change

in the climate at Boston, of ten or twelve degrees." Mr. Williams, in our opinion, has rated the change too high—he did not take into consideration the quantity of improved land, and the *ratio* it bore to the uncleared which would have given a correcter result. His conclusion is drawn from the average of cold and heat in each month, between 1780 and 1788. To average the temperament of each month in the year, and then average the whole is a very imperfect mode of ascertaining the degrees of heat and cold. The result may not give ten hours of such weather as actually exists in a year. There may be as much heat and cold, and even more in a year, as formerly, and they may not be so intense. The true rule or method would have been, to have given the maximum and minimum of heat and cold each year. There may be as much cold in a year and the bays may not freeze. It is the intensity that freezes, not the average. In this respect, certain American and English meteorologists have constantly been in error. It is vain to find out the state of the weather from their averages or mediums, unless we look over their tables. Their results or conclusions are mere amalgams, showing the average of heat and cold in 365 day, without showing their intensity.

The same author made a series of observations in the months of May, June, July, August, September, October and November, in the year 1789, at Rutland, in the State of Vermont, in latitude forty-three degrees and thirty-six minutes, for the purpose of ascertaining whether the heat of the earth be increased or not by cultivation. On the 23d of May, he sunk a thermometer to the depth of ten inches below the surface of the earth. Upon repeated trials, he found that the mercury stood at fifty degrees; this was in a level, open field, used for pasture, and fully exposed to the sun. He then made the same experiments in the woods, where the surface of the earth was covered with trees. To ascertain the gradual increase of heat at each place, he often repeated his observations. The following table exhibits the times, degrees of heat, differences, &c. :—

Time	Heat in the pasture.	Heat in the woods.	Differences.
May 23.	50 degrees.	46 degrees.	4 degrees.
28.	57	48	9
June 15.	64	51	13
27.	62	51	11
July 16.	62	51	11
30.	65.5	55.5	10
August 15.	68	58	10
31.	59.5	55	4.5
Sept. 15.	59.5	55	4.5
Oct. 1.	59.5	55	4.5
15.	49	49	0
Nov. 1.	43	43	0
15.	43.5	43.5	0

Hence, he concludes, that by exposing the land to the full force of the sun, in this latitude, a heat, at the depth of ten inches below the surface, is induced equal to ten or eleven degrees greater than that in the forest, and that consequently, this heat is retained so long in autumn as the rays of the sun increase the warmth of the earth. That this additional heat in the earth will be sufficient to produce the same alteration in the temperature in the atmosphere. That thus the earth and the air, in the cultivated parts of the country, are heated in consequence of cultivation, ten or eleven degrees more than they were in their uncultivated state. Rutland, where these experiments were made, is about 641 feet higher than the surface of the ocean.

From the deduction drawn by this author, he would be understood, that the difference is ten or eleven degrees. That he is correct as to a certain period of the year, we readily assent, but his conclusion will not hold true as to the other period, unless all the woods are cut down and the lands tilled.

Upon clearing and cultivating lands, the soils, in the course of time, undergo almost entire changes, and new ones are formed. The swamps and marshes are drained; the surface of the ground becomes drier and the soils are mixed. Evaporation is greater in a cleared country than in a woody one. The rays of the sun meeting with no obstructions, act with greater

energy: the winds also sweep the surface and co-operate with the sun. The northwest wind is a powerful agent in evaporation. This is exemplified, in a striking manner, after heavy rains. The water disappears, the mud dries up, and in two or three days the ground appears as though there had been no rain. There is another cause of evaporation, and it is this: the warmth which the earth imbibes from the sun. This being imparted to the atmosphere, occasions the wet and moisture to rise in vapors. Humidity is a cause of coolness and aridity of warmness.

An amalgamation of soils is a better receiver and conductor of heat. That is, it receives it faster and more abundantly, and imparts it slower, and for a longer time; all of which circumstances tend to the melioration of the climate.

The rivers, creeks and brooks decrease. Many small streams totally disappear in summer. This State, and several of the other States, afford innumerable instances of the drying up of streams.

The cutting down the woods diminishes the quantity of aqueous vapors. The dews are not as copious now as they were formerly, and they are becoming less so every year. The rains are not so copious, nor are they so frequent as they were. Hence, other causes of the change of the climate.

The decrease of snows, and their having less duration, is also a cause of the change. The snows now fall later, have less permanency, and go off earlier than they did. Snow and ice chill the atmosphere. This must be apparent to every body. Our open winters are less severe, because there is not much snow or ice in the improved country to chill the air. The absence of snow, is one cause of a milder temperament in the climate. In our fields, the snow cannot accumulate as it once did, because the sun is daily dissipating it.

At the first settlement of this State, and we might add, all the subsequent ones that have been made, the earth was generally covered with snow for three, four or five months. It usually commenced falling by the middle or latter end of November, and continued to fall to the first or middle of April, at

which time it began to go off. The ground was seldom bare before the fifteenth of April, or the first of May. This still continues to be nearly the case in the extensive forests. The snows then accumulated to the depth of from two to four or five feet. This is the case at the present day in the forests. In Redfield, in the county of Oswego, the snow occasionally attains the depth of five feet on a level. There are many other places where it is nearly or equally deep. The snows, however, at Redfield, as well as other places, have visibly declined, as improvements have been made. The decline of snow seems to be in a ratio with the improvements.

Considerable alterations have occurred in the winds. Those that are general, have, in the main, less duration. The northwest, northeast and east have declined. They are no longer so cold as they were, because there is less snow to cool and freeze them. Local winds, or currents, have been established, which have more or less effect.

Dews.

The quantity of water which annually falls in the form of dew, is considerable, but we have no way of ascertaining the amount. It varies very much in different parts, and in different years.

Dr. Hales imagines, that the quantity which annually falls in England, on moist earth, is upwards of three inches—Mr. Dalton supposes it exceeds five inches. The quantity which yearly falls with us, in all probability, exceeds that which falls in England.

We have a greater number of fair days in a year than they have in England. Besides, more rain falls here than there. The forests also have a tendency to increase the quantity. Dews are composed of vegetable emanations, and evaporation from the earth, the surfaces of lakes, ponds and streams. These mount on high during the day, and are condensed in the course of the night, by the superior atmosphere which sinks upon them. Calmness, or something like a state of repose in

the atmosphere, is indispensibly necessary to the production of dews. They never occur in windy or cloudy weather. They are most abundant after heavy rains, when the weather has become settled, and least towards the close of long droughts.

Rain.

We are unable to say what the mean quantity of rain falling in the State, annually is, but we think that it cannot be less than that of some of the neighbouring States.

The mean quantity which falls at Rutland, in Vermont, has been ascertained to be . . . 41.197 inches.

At Cambridge, in Massachusetts .	35.396	do.
Philadelphia . . .	35	do.
Williamsburg . . .	47	do.
In Europe the quantity is less.		
At Paris, the annual average fall is	20	do.
Lyons	37	do.
Padua	37.50	do.
Pisa	34.50	do.
Rome	20	do.
Berlin	19.50	do.
Harlem	27	do.
Dort	40	do.
Manchester	33	do.
Lancaster	40	do.
London	22.40	do.

It is allowed that more rain falls in the northern and middle States, than does in those parts of Europe which are situated under the same parallels of latitude. The difference is not yet known. Several have made contrasts, and thence deduced the difference, but as these are contradictory, little or no reliance can be placed in them.

Remarks on the difference in vegetation in some parts of the State.

Vegetation in the eastern parts of Putnam, Dutchess, Columbia, Rensellaer and Washington, is seven or eight days later

than it is along the river Hudson. This is the usual difference in the harvest.

This remark will apply to those places situated seven, eight, or ten miles south or north of the Mohawk river. Indeed, on the south side of that river, where the aspect is northern, it is greater. A difference of twelve days is by no means uncommon.

Eight or ten miles south of the heads of Cayuga and Seneca lakes, the difference is a week or more. The lands rise on leaving the heads of these lakes.

On the Highlands, in the county of Oneida, harvest is nearly or quite two weeks later than it is at Whitestown, on the Mohawk.

Between Sandy Hill, in the county of Washington, and the Highlands, or Matteawan mountains, on the borders of the Hudson, the harvest is earlier, by a week, than it is on the Mohawk between the eastern limits of Montgomery, and the western limits of Herkimer, keeping in the river valley.

In Otsego and Delaware counties, to which some others might be coupled, the harvest is two weeks back of that on the Hudson.

Elevation, aspect, cultivation, soil and latitude occasion the differences.

Improved and Unimproved Lands, &c.

The State contains upwards of twenty-nine millions of acres of land, exclusive of water. Of these about seven million one hundred and sixty-one thousand acres are cleared and cultivated. The remaining twenty-two millions of acres are woods. Of the latter, we suppose about ten millions of acres may be improved. The improved lands then, at this time, comprise less than the one-fourth of the whole.

All the improved lands in the State of New-York, in the year 1775, did not surpass one million of acres, some under the one-twenty-ninth part. This supposes a population of about 230,000. In 1825 the population amounted to 1,616,458, and the improved lands to 7,161,000 acres. This

would give four acres, and rather over one-third of an acre to each inhabitant. The quantity of improved land in 1775, it is probable, bore a similar ratio to the population then, that the improved land did to the population in 1825. Admitting such to have been the fact, the improved lands in 1825, were more than seven times greater than they were in 1775. The improved lands then comprised, say, the one-twenty-ninth part, and in 1825 nearly seven-twenty-ninths, or some under the one-fourth. The surface exposed to the sun in 1825, was more than seven times as large as it was in 1775. No wonder then that the winters are shorter, the snows not so deep, and the weather more variable, but in the main not so cold. Nor is it to be wondered that the snows disappear in the clearings first, and much earlier than formerly, when we take into account the increased action of the sun on the surface. Before 1775 the clearings were too inconsiderable to have had any visible effect on the climate generally. The effect was confined to spots, and scarcely preceptible, being similar to those places in the depths of forests, where there are small improvements. But after all, the changes induced are not entirely owing to the clearings made in the State; those which have been made in the neighbouring States and Provinces must be taken into the estimate, since they have extended the sphere of the sun's action. We cannot, however, determine the extent of the changes in the climate. The data are too loose. They are, however, in our opinion, not so great as some have supposed, nor are they so small as some have imagined. The European writers, in general, have been unwilling to allow of scarcely any change; and the American, taking opposite grounds, have allowed too much. The historian of Vermont supposes a change at Boston of ten or twelve degrees. Volney supposes that no change has ensued in the United States. Both are evidently mistaken.

The following observations and remarks, in relation to the climate, we think, cannot fail to interest most readers:—

January 7th, 1815, the Mohawk river was covered with ice for the first time. On the 10th, loaded carriages passed and

repassed. The snow in the valley of the Mohawk was two inches deep; at Johnstown, four miles north, and about three hundred and fifty feet higher, four inches; at Kingsbury, five miles northeast of the latter place, six inches; on the summit of Mayfield mountain, or Clip Hill, six miles northwest of Johnstown, ten inches; and at Caroga lake, about three miles farther, fifteen inches. Clip Hill, hereabouts, is about one thousand feet above the level of the ocean. This part of the country borders on the forest, and is imperfectly cleared. At the latter place, the snow had covered the ground for more than a month, and the ice the streams.

Between the thirteenth of January and the first of March, the snow at Johnstown, and its vicinity, had accumulated to the depth of about two feet on a level. The weather during this time was pretty severe, and the sleighing very good.

On the second day of March a heavy thaw commenced, which did not entirely abate before the fourteenth; the Schoharie creek broke up on the third, the Mohawk on the sixth, and the Hudson between the eighth and ninth. Sloops sailed from Albany for New-York between the eleventh and fifteenth.—This thaw was so violent, and of such continuance, that it swept away all the snow at Johnstown, and in the clearings, throughout the Mohawk country, except such as lay along fences and other situations, where it had been heaped by the winds. But it did not sweep off the snow in the woods at Stratford, fourteen miles northwest of Johnstown, and ten or twelve north of the Mohawk river; nor did it break up the streams and ponds.

Stratford is within the forest already noticed, and consists of two settlements, the east and the west, which are separated by a wood eight miles broad.

The sleighing in the eight mile woods, after the thaw, was excellent. The streams were covered with ice, and there were no symptoms of spring. The thaw, although it had lasted twelve days, and had carried off all the snow in the cleared parts of the Mohawk country, had had no other visible effect on the snow in the eight mile woods, than to settle it, the quantity

being about the same. The snow, we would remark, was between three and four feet deep when the thaw began.

On the twenty-ninth day of March, the snow at Benson, eighteen or twenty miles north of the village of Johnstown, was two and a-half feet deep on the low grounds, and from three to three and a-half on the northern slopes of hills. The ponds and streams were still covered with ice, and there was no indication of spring.

On the fourth of April the snow was as deep as ever. The quantity on the seventh was about the same, with this difference, that it had settled down.

Between the third and seventh it rained almost all the time at Johnstown, yet no rain fell at Benson, it only misted or fell in sleet. During this time, dense clouds continued to pass over from east northeast, to south southwest.

The snow was still about two feet deep in the eight mile woods, at Stratford.

April tenth, it was upwards of twenty inches deep in the eight mile woods: spring, however, had begun to announce itself.

Even as late as the eighteenth the ground in the eight mile woods was mostly covered with snow, but spring was advancing a pace.

The snow, at Benson, on the tenth day of April, was about two feet deep, and the streams and ponds were locked up with ice.

April twenty-third, the ground in the woods at Benson was still covered with snow, but the streams and ponds were mostly freed of ice. The snow had chiefly disappeared in the cleared lands.

Benson is situated in the forest which we have before noted, but it is less cultivated, more elevated, and at a greater distance from the improved country than Stratford, which seem to be the causes of the difference in depth and the duration of the snow.

Now, during the whole period comprised between the fourteenth day of March and the twenty-third day of April, the ground at Johnstown, and its vicinity, and generally speaking, all the improved parts of the Mohawk country, were, with two

or three exceptions, in which the snow fell three or four inches deep, and remained two or three days, and then went off as bare as in summer.

Such extraordinary differences in the depth of snow, its continuance and disappearance in places so very near, and differing only a few hundred feet in elevation, and in some instances not any, will appear almost incredible to persons unacquainted with the facts and circumstances attending them. But extraordinary as they may appear, they are true, and are to be accounted for by the clearing away of the woods, and the cultivation of the lands.

December 5, 1815, the Mohawk was mostly shut up with ice.

On the twenty-sixth the snow was two inches deep at the village of Johnstown, and the neighbouring parts, which was the greatest depth that had fallen. At the same time is was three inches deep at the foot of Clip Hill, six inches on its summit, and nine or ten in the forest, and just within its frontiers, and thence to Stratford, and through the eight mile woods. But there was no snow in the valley proper, or ravine along the river.

About the same time the Mohawk was entirely closed with ice. The cold was not, nor had it been, very severe.

There was no sleighing between the first and eleventh of January 1816, in the valley of the Mohawk, and its vicinity; but at the same time it was good from the top of Clip Hill, four miles northwest of the village of Johnstown, to Lowville, in the county of Lewis, a distance of upwards of eight miles. The road from the summit of Clip Hill to Lowville, runs along, or near the borders of the forest, on high ground.

The ground was frozen to a considerable depth, and it was very good wagoning from the foot of Clip Hill to Albany, and from Johnstown to Utica, by the valley of the Mohawk.

On the eleventh the snow fell ten inches at Albany, and about seven at Johnstown, but none fell at Onondaga. It came from the east. The cold was not severe.

The sixteenth a thaw began, which lasted to the twenty-third. This thaw carried off all the snow at Albany, and in the cleared

parts of the Mohawk country, nearly as far back as the forest, and occasioned partial breakings up in the Mohawk and Hudson.

From January twenty-ninth, to February twenty-second, there was no sleighing east of Anthony's Nose, which is the termination of Clip Hill, and west of the mouth of West Canada creek; but within these two places there was some, although quite indifferent. The sleighing, however, from the top of Clip Hill, four miles northwest of Johnstown, to the West Canada creek, at the head of the noted Trenton Falls, and from thence to Martinsburgh, in Lewis county, was good.

The snow, at no time, during the months of January and February, exceeded ten inches in the valley of the Mohawk, nor fifteen on the hills, at the distance of four or five miles, but along and within the forest, at the distance of from nine to sixteen or eighteen miles, it was from one foot ten inches to three feet; and between Trenton Falls and Martinsburgh, in Lewis county, from three to three and a-half feet; at Redfield, in the county of Oswego, twenty-five or thirty miles northwest of Utica, it was still deeper, being about four feet.

On the twenty-fifth of March, the snow was from three to four feet deep in Salisbury, Stratford and Benson.

A thaw, accompained with a heavy rain from the southwest, commenced on the twenty-sixth day of March. This thaw carried off the snow in the open country, and broke up the Mohawk river on the twenty-eighth.

On the eleventh day of April the snow fell six inches deep in the valley of the Mohawk, but the fall, a few miles back, on the high grounds, was much greater. The cold was very severe for the season of the year, so much so, that ice was formed two or three inches thick.

The snow, on the twentieth, was two and a-half feet deep in the woods at Salisbury, Stratford and Benson, and the streams and ponds were covered with ice, which had been formed the preceding December.

The snow on the south side of the river, at the distance of six or seven miles, was one foot deep in the woods, on the

twenty-first day of April; but there was very little in the fields, and none in the valley.

The months of April and May were very cold, so much so, that vegetation did not commence before June, upwards of a month later than usual; and it was so tardy after it had commenced, owing to the cold, that the forest trees along the valley were not perfectly clothed with leaves before the twenty-second.

The cold was so great, during the night of the eighth and ninth of June, as to form ice the eighth of an inch in thickness, in the valley of the Mohawk.

On the ninth it snowed most of the day in the county of Courtland, as we were assured by a person of veracity, who happened to be then in that county, but it melted soon after it had reached the ground. At the same time, the snow fell at Cabot and Montpellier, in the State of Vermont, to the depth of eighteen inches; and at Williamstown, in the north-western corner of Massachusetts, twelve inches, as was shortly after announced in the newspapers. These places are situated within the Green mountains, and are elevated; the snow, however, was considerably deeper on those mountains.

The extreme cold, during the months of April, May and June, and the fall of snow, and the formation of ice in the Mohawk country, in the latter month, are unparalleled in the annals of the State, and cannot serve as data in making an estimate of the climate and its changes.

In truth, the whole summer of 1816, and the autumnal months of September and October were uncommonly cold, and very dry. In the Mohawk country, the cold was such that the Indian corn did not ripen, a thing altogether unheard of before. Very few fields had a single ear of ripe corn, and for an extent of sixty or seventy miles, enough did not come to maturity for seed the ensuing spring. The frost came between the fifteenth and twentieth of September, when the corn was in the milk, and destroyed it.

We find a similar order of things in other parts of the State. We shall subjoin two extracts from Mr. David Thomas' Travels:—

"On the shore of Lake Erie, at Buffalo, in 1816, the ice did not disappear till the twentieth day of May. Vegetation was two weeks later than at Cayuga. The elm, the beach and sugar maple had not leaved out. Page 16.

"The influence of the lake, in retarding vegetation in the spring, is rendered strikingly visible. On the 27th of May 1816, the trees were leafless along the shore, but in the thick woods, back of the bluffs, at a short distance, the beaches were green." *Ibid.* 25.

Notwithstanding the coldness of the summer and fall, no snow of consequence fell before the twenty-fourth day of November, on which day it fell about five inches in the valley of the Mohawk, and somewhat deeper on the adjoining hills.

The cold, between the seventh and fourteenth of December, closed the Mohawk and its dependants, with ice; but between the twenty-fourth and twenty-sixth of the same month, they were all broken up by a sudden and violent thaw.

The Mohawk closed a second time, between the tenth and fourteenth of January 1817. The ice, formed in this short period, was so thick and strong, that wagons, carrying from two to three tons, were drawn over by horses.

The snow, between the 14th of January and the first of March, accumulated to the depth of two feet and a-half in the valley of the Mohawk; three feet on the hills, at the distance of five or six miles; on the borders of the forest three feet and a-half, and within the forest four feet, as we were assured by some of the inhabitants.

The cold, between the 14th of January and the 16th of February, was unusually severe. At one time, as we learned from the New-York city papers, East river closed up so, that many persons passed from the city over to Brooklyn. New-York bay, which is eight miles long, and from two to four broad, and agitated by very strong tides, was, literally speaking, covered with loose floating ice, which threatened to combine and become fixed.

At New-York the thermometer was 25 degrees below zero, and 30 at Utica.

This severe cold lasted but one or two days, and cannot be compared with that of the winter of 1780, 1781, when East river, Hudson's river, and New-York bay, were froze over for forty or fifty days, so strongly that heavy pieces of cannon were transported over the ice to Staten Island.

The month of March, notwithstanding the severity of the weather, in the two preceding months, and the great depth of snow, was mild, the snow dissolved gradually, and the Mohawk broke up between the 3d and 6th of April. The fields were bare, some few places excepted, where the snow had been drifted.

November 19th, the snow fell between one and two inches, between Johnstown and Oppenheim, but along the valley of the Mohawk it melted as soon as it came to the earth.

On the fifth day of December, the valley was covered, for the first time, with snow, and to the depth of two inches.

The Mohawk, between the eleventh and sixteenth, was chained with ice. The snow along the valley, and thence back for several miles, was inconsiderable. During this month the weather was not severe.

On the second day of January 1819, the ground at Albany, was as bare as in summer; the Hudson, however, was covered with ice, so that carriages passed.

Between the seventeenth and twenty-third, there was a great thaw, accompanied with such heavy falls of rain as to occasion partial breakings up of the Mohawk and Hudson.

We had not one day's sleighing during this month, either in the valley of the Mohawk, or in the open country, lying in its vicinity, nor was there until the twenty-fifth day of February, in the subsequent month. The weather was mild, but very variable; rains were frequent and heavy. They came either from the east or southwest.

Those from the southwest were accompanied with loud thunder and copious lightning.

On the first day of March, the snow in the valley was about six inches deep, and on the hills, within six or seven miles, from eight to ten inches.

The snow increased throughout the month, to such a degree, that on the first day of April, it was two and a-half feet deep in the valley, and from three to three and a-half, and even four, at the distance of from ten to twenty miles on the north side. Between the fourth and seventh, there was a heavy thaw, attended with considerable rain, which swelled the Mohawk, and freed it from ice.

The cold returned on the abatement of this thaw, and as the snow remained in large quantities, the sleighing was pretty good along the valley to the eleventh. This cold was followed by a succession of warm days, which lasted till the snow went off, and the ground was settled.

The weather had been so mild, and the heats so considerable, that by the ninth of May, apple trees, and other fruit trees, were in full blossom, an occurrence which had not happened in this part of the country for thirteen years before.

May twenty-fifth, the fields and forest trees were covered with verdant carpets.

The weather, during the fall, in the improved parts of the Mohawk country, was very mild, so much so, that we had not one cold day.

On the seventeenth of October, the snow fell an inch deep in the valley, but went off in twenty-four hours. More fell on the hills. According to the newspapers, the snow fell, on the same day, in the town of Redfield, in the county of Oswego, fifteen inches, and in the counties of Chatauque and Alleghany one foot.

The cold began on the third of December, and was so considerable, that by the sixth it closed the Mohawk, but the ice was not sufficiently strong to allow sleighs to pass before the seventeenth.

On the first day of January 1820, the snow along the valley had attained the depth of a foot. It continued to increase to the thirteenth of February, when it was three feet in the valley. Between Trenton Falls and Martinsburgh, it was four feet and upwards, as we were assured by persons who had been out into those parts. On February thirteenth, a violent thaw ensued,

which carried off the greater part of the snow in the improved lands. The Schoharie creek broke up, and likewise the Mohawk, from the mouth of that creek, downwardly.

The weather was mild throughout March, but there were some heavy falls of snow. The Mohawk had broken entirely up by the twenty-eighth.

During April, the weather was regular and mild, occasionally hot. The snow went off gradually, and by the heat of the sun, but the fields in the cultivated country were not entirely bare before the twentieth. Although the snow had left the cleared lands, it still remained in large quantities in the forest, overspreading the country around the upper parts of East and West Canada creeks, because those creeks were very much swelled on the twenty-fourth, and were on the rise. The rising of those creeks must have been wholly occasioned by the melting of the snow by the sun, because the sky had been clear for ten days, and no rain had fallen during that time.

The rise was so great, that those streams filled the banks of the river, and produced partial inundations.

The Canada creeks have annually two or more breakings up. The first are confined to their lower parts, seldom extending upwardly over twelve or fifteen miles, and are usually later than the breakings of the Mohawk. The second, or last breaking up, is in their upper parts, bordering and within the forest, and is commonly from three to five, and sometimes six weeks after that of the Mohawk. The first breakings up in West Canada creek, often reach as far as the foot of Trenton Falls, twenty-two miles, and are mostly to be attributed to the country being more cleared than it is along the East Canada creek.

Between the twenty-fourth day of April 1821, and the eighth day of May, in the same year, we witnessed the same occurrence. The West Canada creek rose and was very high. The rise began about the twentieth of April, and did not reach its achme before the seventh of May.

There was no rain from the tenth of April, to the eighth of May, except some gentle showers, limited in extent and duration, and which could have had no agency in raising the stream.

The Mohawk, above the mouth of West Canada creek, had abated six or seven feet, and still continued to abate every day.

On the seventeenth of April 1822, the West Canada creek commenced rising, and continued to rise to the morning of the nineteenth, when it had reached its maximum. It was higher than we had ever known it before. This rise was likewise occasioned by the melting of the snow, in the woody country, above Trenton Falls. The weather, previous thereto, had been settled for about two weeks. The thermometer, on the eighteenth, rose to seventy degrees.

The Mohawk, as usual, above the junction, was low, and was on the decrease.

It would be useless to adduce more examples, because the same happens almost every year, between the sixteenth and twenty-fifth of April, and will until the country, above Trenton Falls, is cleared up to the sources of this creek.

On the twenty-third and twenty-fourth of April 1820, the sugar maple began to put out leaves, and so rapid was vegetation, that by the third of May, apple trees were in blossom. However, from the eleventh to the end of the latter month, the weather was cold. The snow fell so as to cover the ground on the twenty-sixth, a mile or two from the valley of the Mohawk: from the newspapers we learned, that the snow fell at the same time in considerable quantities on the Kaatskill and Green mountains. The frost, which came on the twenty-eighth, destroyed most of the fruit, and killed the leaves of the walnut, and some other trees.

The snow, between the twenty-fourth and twenty-fifth of October, fell to the depth of four inches in the valley, and six inches at the Osquake, eight miles south of the river. The depth was proportionably deeper back of this. A rain ensued and carried it all off.

Between the seventh and thirteenth of November, the cold was such, as to shut the Mohawk in many places: on the latter day, there was a fall of six inches of snow in the valley. It came from the northeast. The papers announced, that it fell to the depth of one foot at Poughkipsie, and that the sleighing

was good throughout the county of Dutchess. There was another fall of snow on the twentieth, of three inches.

On the first of December, the Mohawk was entirely shut up, and remained so during the month. Sleighing was pretty good.

The weather, from the thirtieth of December, to the twenty-ninth of January 1821, was very severe, and snow came in abundance.

Intense cold weather pervaded all the northern and middle states On the eighth and ninth the snow fell eighteen inches at Philadelphia. The Niagara river closed as far up as Lewistown, at the foot of the heights, on the second of January, an occurrence which had not happened for fourteen years before. On the twenty-sixth, New-York bay froze over, and persons passed over on the ice, to Staten Island and Long Island. The ice extended some distance below the narrows. The ice, however, remained but a short time in East river and the bay.

The floating ice, precipitated down the Falls of Niagara, was stopped and accumulated to the heighth of one hundred and twenty-five or thirty feet, and almost filled the chasm below those falls.

The weather, during February, was rather mild than severe. Several thaws occurred, which swept away most of the snow in the valley of the Mohawk, and those parts near it; but back towards, and within the forest, it still remained.

March was so mild that the Mohawk had become entirely freed from ice by the twentieth.

April the ninth, the ground throughout the valley of the Mohawk was entirely bare, and had been for some time before. On the twelfth, the snow fell at Albany seven or eight inches, at Duanesburgh one foot, and at Charlestown, on the high lands, fifteen inches. A thaw, however, soon carried it away.

May tenth, apple, cherry and plumb trees were in full blossom. They were several days forwarder west of Oneida creek. We have noticed a marked difference between the country east and west of this creek. And this difference is so striking that we discover it in travelling less than four miles, and that in a flat country.

The snow fell on the 25th of November 1821, seven inches in the valley of the Mohawk. This was the first fall, of any moment, in this section of country, although it had fallen to a considerable depth on the Highlands, between the Mohawk and Black rivers.

The Mohawk shut up between the fourteenth and seventeenth of December: sleighs passed on the latter day.

On the nineteenth, the snow between Trenton and Martinsburgh, exceeded three feet in depth.

The snow, on the twentieth, was sufficient to make good sleighing throughout the Mohawk country.

The winter of 1821, 1822, had considerable mildness. The Mohawk was freed from ice by the second of March, and the ground along the valley, and for some miles back, was as bare on the twentieth as if it had been summer.

The snow, on the first of November 1822, fell eight inches deep in the valley, but it was all swept off by a rain that ensued the falling.

The cold weather began on the first, and lasted to the tenth of December. The Mohawk closed in some places. The thaw, between the tenth and eighteenth, released it from ice. The Mohawk was entirely locked up with ice by the thirty-first.

Loaded wagons passed on the first of January 1823.

On the first of April the ground along the Mohawk was mostly covered with snow, but it had disappeared by the twelfth.

The winter cold began December fifth, and by the sixteenth, the snow along the valley, had attained the depth of ten inches.

The Mohawk shut up. The stages from the city of Albany, arrived at Utica on runners, before four o'clock in the afternoon, a distance of ninety-four miles. The weather was not severe. A succession of gentle thaws, gentle rains, and gentle freezings, covered the Mohawk country with ice. The whole was a glade, and continued so for fifteen days. The like had never been known before.

A thaw, between the ninth and twelfth of January, broke up the Mohawk, and the lower part of West Canada creek.

The Hudson was also broke up, and sloops sailed from Albany to New-York shortly after, an event which had not occurred since 1756.

The cold which followed this thaw, closed both rivers again, but they were broke up between the twelfth and thirteenth of February, for the second time.

But, notwithstanding two heavy thaws, and a very mild winter, the snow at Redfield, in the county of Oswego, was, at the cessation of the second thaw, from two to three feet deep.

The depth of the snow on the Highlands, between Trenton Falls and Martinsburgh, was, according to the testimony of reputable persons, two feet. Indeed, the whole of the Highlands was covered to a considerable depth. We have seen the same between Trenton Falls and Martinsburgh, as what we have related, on two occasions, with this difference, that it was four feet deep, while the cultivated parts of the Mohawk country, were mostly bare. The snows, however, which fall on the Highlands are not so deep as they were formerly, before the country was improved, nor are they so early, nor do they continue so late, nor is the weather so very severe. The changes follow the clearings. Redfield is not the highest part of the Highlands of Black river, although more snow falls there than in any other part, at this day.

The fruit trees were in blossom along the Mohawk as early as the sixth of May.

The snow fell on the twenty-ninth of October 1824, on the Highlands, between Utica and Martinsburgh, from one to two feet deep, but none fell in the valley of the Mohawk, or adjacent thereto. On the thirtieth the stage went on runners for forty miles. The weather was cold, and had every appearence of winter. Such was the information which we had from travellers.

On the morning of November first, the ground in the valley was whitened with snow, but it vanished in the course of the day.

This trifling fall, we think, must have been occasioned by the snow on the Highlands chilling the superior atmosphere over

the valley of the Mohawk, to such an extent as to transform the vapors, which would otherwise have descended in rain into snow.

The Niagara Centinal, of November fifth, announced the fall of snow to the depth of two feet in some of the southern towns of Erie, and the formation of ice three or four inches thick.

This fall must have been about the twenty-ninth of October.

December was very mild, more like April than winter.

The winter of 1824, 1825, was the mildest in the improved parts of the State, of perhaps any known since the colonization. There was very little snow and cold. Between Albany and Utica, *via* the Mohawk, there was not one week of sleighing, had the whole time been put together ; and west of Utica, to the Niagara river, there was not three days, unless about Oneida lake. There were but two falls of snow which could have been said to extend much beyond whitening the ground, and these were inconsiderable, especially to the west. We speak, however, only of the line from Albany to Utica, and thence to Niagara river, and the country along Hudson's river, from the Matteawan mountains, northwardly to Lake Champlain.

The first fall was about the twelfth of January, and did not extend westwardly of Onondaga. It came from the east, and was seven or eight inches at Albany, as we were told ; at Herkimer there was about half that depth.

The second came the twenty-ninth and thirtieth of January, and was from the east. We were informed that it fell to the depth of eighteen inches at Albany, fourteen at Utica, nine or ten at Onondaga, and about seven at Genesee river.

At Newfane and Lewistown, in the county of Niagara, it fell about six inches, as we saw, and came from the northeast. We, however, have little hesitation in avering, that the apparent difference arose from the direction of the St. Lawrence valley, and the configuration of the basin of Lake Ontario. From the foregoing facts, it will be seen that there was a pretty gradual diminution all the way from Albany to Niagara river. Most of this snow was swept away by a great thaw on the fifth

and sixth of February. This thaw extended over perhaps one-half of the State. It seemed to have occupied two principal lines, besides some others of smaller extent. In the west it extended along lakes Erie and Ontario, and over the great plain and the champaigns, and some of the hilly tracts, as far eastwardly as the county of Oneida. In the east it extended along the Hudson, northwardly to Lake Champlain, &c.

From the Hudson champaigns it detached a branch which proceeded up the Mohawk, as far as the Nose, or Fall Hill, where it was met by a branch from the west. Thus uniting, the two winds sweept off most of the snow. South and north, however, of the branches, the thaw had little effect on the snow, the quantity remaining nearly the same.

The winds which brought on this thaw were southwest and south. The former prevailed at the lakes, and came from the torrid zone, as its rapidity and volume, and hot globular masses, seemed to announce. The latter, it is probable, came from the same zone, but was moister and cooler owing to its being saturated in its passage over the ocean, and owing to its having less volume.

West of Oneida we saw no snow except in some swamps and moist grounds. Even in these instances it was limited, and remained sparingly.

In the west the frost came out of the ground, and there was an entire breaking up, as much so as in spring.

March 8th, 1825—while we have had no sleighing in the valley of the Mohawk, for a month past it has been, till within a week, tolerably good at Fairfield, and very good from Salisbury to West Canada creek, and from thence to Martinsburgh.

The thaw of Febuary 5th and 6th, and a subsequent thaw nearly as great, were not able to carry off the snow around Oneida Lake, but the ground remained mostly covered, as we were assured by persons who had seen it. Oneida Lake is only 370 feet above tide water, and the general elevation of the country, at the distance of six or seven miles is not perhaps over four hundred and twenty, but the country is covered with woods. The land is swampy, and much of the timber is cedar, hemlock,

and black ash, all of which are retentive of cold and moisture, and may be assigned as the causes of the depth and continuance of the snows round this lake.

The snows have always been deeper around this lake than they have been ten or twelve miles south, although the lands are considerably higher, and will always be until the woods are cut down, and the swamps drained, and the earth exposed to the warmth of the sun.

The willow trees, on the east side of Fall Hill, and adjoining the Erie canal, were green as early as the tenth of April 1825. The gooseberry, at the same time, was green. April twenty-eighth and twenty-ninth, the red plumb tree was in full blossom; the apple and peach tree had begun to blossom. Some of the forest trees, particularly the sugar maple, appeared green.— The grass had been sufficiently abundant for the subsistance of cattle for twelve days.

November the eighteenth, the cold began, and some snow fell; the Erie canal and Mohawk were closed in some places. Snow fell in the county of Onondaga, on the twelfth, five or six inches deep.

In the valley of the Mohawk we had no sleighing till the second of January, and then it was indifferent.

A thaw, which began on the ninth of January 1826, and continued to the evening of the eleventh, swept away the snow, broke up the West Canada creek, and Mohawk and Hudson rivers, and raised them to unusual heights. The thaw was accompanied, in the Mohawk country, west of Fall Hill, with wind and rain, which came from the southwest. The weather was mild and even warm. This thaw was terminated by the northwest wind.

Although the snow went off very early in March, vegetation, owing to the colds during April, was tardy. On the first day of May it had not commenced. On the second, warm weather began. On the fifth, the sugar maple, elm, &c. had assumed a greenish tint; the red plumb tree began to show its blossoms, &c. On the tenth the blossoms of the red cherry tree were out.

The winter of 1827—1828, was the openest ever known. The Hudson, with the exception of a few days, was navigated the whole winter. The first interruption was about the twenty-second of December, when the steamboats had to stop at Poughkeipsie landing. The river above was partially obstructed with ice, to the fourth of January. On that day a steamboat went up to Athens; and on the eighth another reached Albany. On the tenth, the river was clear of ice. From the twelfth to the twentieth boats plied between Troy and New-York. The cold, between the twentieth and thirtieth of January, suspended the navigation above Poughkeipsie. On the fifth of February, the river was liberated of ice. From that time sloops and steamboats navigated it.

Between the fourteenth and seventeenth of January, a boat navigated the canal from Rochester to Buffalo, ninety miles.

The canal might have been navigated from February eighth to March second, &c.

Between Albany and Utica, there was not four days of sleighing, and between the latter place and Buffalo, not two. In the counties of Cayuga, Wayne, Munroe, &c. the ground was bare almost the whole winter, and broke up. The weather was mild with a few exceptions. Some days were warm. Bees came out. Flies appeared. The buds of willows swelled, and vegetation threatened to burst out about the eighteenth of February.

The climate of the Mohawk country is not the same it was fifty or sixty years ago. The same may be said of the Onondaga, Genesee and Susquehannah countries, and parts of the country along the St. Lawrence and Black rivers, and about the eastern end of Lake Ontario, and generally speaking, wherever large settlements have been made. That these changes have been induced by the openings made in the forests, we think, can admit of no reasonable doubt, since they have every where followed the clearings of the lands, and have been rapid or gradual, and in a ratio to those clearing; while in those extensive forests that still remain, the climate is the same, or very nearly the same, it was in former times.

The oldest inhabitants with whom we have conversed, all uniformly agree, that fifty or sixty years ago, the winters were much longer, the snows much deeper, the cold much greater, and the weather much more regular than it is at present; that the springs and falls were shorter; that the summers were also shorter; that the winters commonly set in between the middle of November and the first of December; sometimes earlier, and continued to the middle of April; that the ground, usually during the whole of this period, was covered with deep snow, and the Mohawk, and its collaterals, with thick, strong and solid ice. That the ice on the Mohawk, so late as between the first and eighth of April, was so thick and strong that it was no unusual thing to run horses upon it. That the Mohawk, and its collaterals, were not then subject to those sudden and partial freezings and breakings up which they are at present; that when they shut up, they remained so, some instances excepted, till they broke up in April. That there was, in general, but one freezing up and one breaking up. That these were almost simultaneous. That the Mohawk rose much higher, and flooded much more land than it now does. That then, as well as this time, the snow upon the cleared grounds, dissolved and went off first, and that in the woods last. That, in both instances, however, the snows came on earlier and went off later. That the snow, when the spring began, melted and disappeared much sooner than it does now. Such is the picture which they give, and we have no doubt from what we have seen, and what may be seen every year, in the unsettled parts of the State, of its correctness.*

The climate of this State, and the neighbouring states, will be very different one or two centuries hence, should improvements continue to be made, as we have every reason to expect they

* The snow was so deep along the valley of the Mohawk, between Schenectady and Fort Hunter, at the mouth of Schoharie creek, on the ninth day of February, 1690, that the messengers dispatched from the former to the latter place, in order to inform the Mohawks of its capture by the French, did not reach it much short of two days, although the distance is only twenty miles. See Smith's History of N. Y.

will be. The climate of Italy, Gaul, Germany, Hungary, European Turkey, and the countries around the Black Sea, is very different now to what it was eighteen or nineteen hundred years ago. We have mentioned these countries, because the facts which history has furnished us with, relative to the climate, are more numerous, and better authenticated than those of other countries. We need hardly mention that all the regions situated north of the Black Sea and the rivers Danube and Rhine, were covered with woods, very much in the same manner that the Fredish States and the Canada's were two centuries ago, and that much of the country situated south of those rivers, was very nearly in the same condition, in regard to improved lands, that the Atlantic States are at this time.

Virgil, who lived a little before the Christian era, mentions in his Georgics, that the rivers of Calabria, in the Kingdom of Naples, froze over. He speaks of it as a common occurrence. The city of Naples is situated in latitude forty-one, very nearly the same latitude with the city of New-York, which is in forty degrees forty-two minutes. Now, Naples is north of Calabria, the latter, in its southern part, corresponding with the south parts of Virginia.

The Tiber used to freeze every winter, so that footmen and carriages passed it. Rome, which is in latitude forty-one degrees and fifty-three minutes, stands on the banks of the Tiber. The city of Hudson is in forty-two degrees and fourteen minutes, and almost in the very parallel of Rome.

The ice on the Po, was so strong, that the heaviest carriages passed. The country through which this river runs, corresponds in latitude with the northern extremity of this State, and the southern parts of Lower Canada. The winters were long, the snows deep, and the weather cold. The forests of Germany and Illyricum then existed, and we might add those of the Hungarian Kingdom.

The Emperor Augustus, who reigned over the Roman world, just before and after the commencement of our era, banished the poet Ovid, to Tomos, a place near the Euxine, or Black Sea, situated in latitude forty-four. Ovid resided at this place near-

ly seven years. During his residence he often saw the Black Sea covered with ice. Oxen and carriages passed over it. Wine, in the greatest colds, congealed. By passing over we understand only portions.

In the reign of the Emperor Constantine, the straits of Byzantium were frozen over. This Emperor died in the year 330.

The Black Sea, in the year four hundred and one, was covered with ice beyond the reach of vision, for twenty days. From the latter fact we do not infer that this sea was entirely shut up.

In modern times the Black Sea does not freeze. The inhabitants of Constantinople would be greatly alarmed were the straits of the Bosphorus to be frozen over.

Constantinople stands on these straits in latitude forty-one. Snow at this place it considered a rare occurrence.

The accounts which Julius Cesar gives us of France, and the Low countries, induce us to believe that the climite was not less rigorous than that of this State, New England, and Lower Canada, which very nearly correspond with ancient Gaul, in situation. The vine which is now cultivated in the greater part of France, and even north of the Rhine, in Germany, could not endure the severity of the climate. The Rhone, the Loire, and Seine, were every year covered, for several months, with ice. The snows were deep, the winters long, and the weather excessively cold. The heaviest loads were every winter carried over those streams on the ice. The Roman armies were obliged every year to go into winter quarters, where they continued for four, five, and sometimes six months. At present the Seine seldom freezes so as to admit the passage of footmen. The Loire and Rhone do not shut up. In 1814, the Allied Powers carried the war into France, and captured Paris. Hostilities continued the whole winter. The campaign was very active. Nothing is said about the weather. Hence, we are to infer that it was ordinary. Paris is in latitude forty-eight degrees fifty minutes, one degree fifty-five minutes farther north than Quebec, in Lower Canada.

The change of climate in Germany, Hungary, Poland, and

other countries, situated on the north side of the Danube and Rhine, has been remarkable. All the Roman writers, and particularly Julius Cesar, Diodorus Siculus and Tacitus, make mention of the severity of the winters. They give us some extraordinary facts, among which we shall state the annual freezing of those rivers, and the deep falls of snow. Gibbon, in his Roman history, has, in vol. 1, p. 346, this passage: "The great rivers which covered the Roman Provinces, the Rhine and the Danube, were frequently frozen over, and capable of supporting the most enormous weights. The barbarians, who often chose that severe season for their inroads, transported, without apprehension or danger, their numerous armies, their cavalry and their heavy wagons, over a vast and solid bridge of ice."

The freezing of the Danube and Rhine happened every year. At present, it is by no means uncommon for those rivers to be shut up, but the difference between now and the times in which Cesar, Diodorus Siculus and Tacitus lived, in the freezing and duration is very great. Then those rivers used to be covered with strong and solid ice, for five or six months, almost every year. The St. Lawrence, from Montreal, downwardly, hardly furnishes a parallel. In Europe, to find one, we must go as far north as St. Petersburgh, or Stockholm. The change in Germany, during the last sixteen hundred years, appears to have been fourteen or fifteen degrees. Changes have been nearly as great in France. In Italy they have been less, owing to its peninsular position, and to the lands having been cleared before the time of Cesar.

According to Polybius and Livy, the Carthagenians, under Hannibal, suffered excessively from the snow and ice, in passing the Alps. In modern times, armies have often passed those mountains without experiencing any of those difficulties. This shows, that, independent of the badness of the roads, the climate, among those mountains, has been mollified, by cultivating the lands.

The winters in Connecticut, Massachusetts and Rhode Island, and we might add New-Hampshire, are much milder than they were when the first colonists came over. Then it was no un-

usual thing to see the ground covered four months, and sometimes longer, with snow, and the rivers to be covered all or nearly all that time, with ice. The harbours were frequently shut up. But a different order of things is to be seen there now. The winters are usually open and broken, the snows are less, and do not cover the ground, unless in elevated places, for a long time. The harbours are usually open. Indeed, it is looked upon rather a remarkable occurrence to see them closed up, but when this does happen, it is temporary, seldom lasting over a day. The rivers, which were formerly chained with ice all winter, have now several shuttings up and openings. In Hazzards collection of state papers, we find this sentence—"on the fifth of April, in the year 1641, the English planters at Good Hope, (Hartford, in Connecticut) by force, prevented the Dutch from ploughing the land." In the same papers we find, that the first colonists of Hartford had well nigh perished by famine in 1636, occasioned by their ship being detained at the mouth of Connecticut river, by its early freezing. Now they plough much earlier, and the river, when it does close, closes much later. Similar changes have occurred in Vermont, New-Jersey, Pennsylvania, and in some parts of Canada. These changes are in consequence of the improvements. The greatest changes have been induced, where the most extensive clearings have been made. Massachusetts, Rhode Island, Connecticut, the flat country of New-Jersey and Pennsylvania afford us the best examples, since, in these States, the improvements have been the greatest.

We have already made the same remarks in respect to the changes in the State of New-York. Long Island, the counties within the basin of the Hudson proper, the valley of the Mohawk, the settlements west of Oneida, as far as Genesee river, and south of the canal, to the head waters of some of the branches of the Susquehannah river, and about the sources of the main stream, and the Chenango branch, furnish the best illustrations. In these the most extensive clearings have been made. Now the winters are shorter, the snows not so frequent, deep, or of such duration as they were in former times.

Climate of Long Island.

The influence of the sea, which surrounds Long Island, renders its climate more temperate, than places in the same parallel, in the interior. In the summer it is regularly fanned by sea breezes, which generally rise in the afternoon, but sometime before, and extend more or less across the island, according to their strength and continuance. These breezes have become so common in the winter, as to prevent the snow from covering the ground for any length of time. The west and southwest winds prevail in more than half the months in the year.

The thermometer seldom sinks below zero in winter, and seldom rises higher than ninety degrees in summer.

The mean, or average temperature of all the months in the year, at Huntington, near the middle of Long Island, in latitude forty degrees fifty-two minutes, appears to be as follows:—

"From the first of September 1821, to the first of September 1822, 51.20—and from the first of September 1823, to the first of September 1824, 50 40. The greatest heat, in the former year, was 94, and the greatest cold 5 degrees below zero. In the latter year, the greatest heat was 90, and the greatest cold 3 degrees above zero.

"Greatest range, in 1822, 99; and in 1824, 94.

"The state of the weather, for 455 days, from the first of September 1821, was 270 clear days, 113 cloudy, 51 rainy, and 21 snowy.

"The temperature of the water, in two wells, at Huntington, on the fifteenth of August 1823, was 53 and 50 degrees. The former was 25 feet deep, and the latter 43. The mean temperature of the springs and deep wells, is about 51 degrees throughout the year.

"Predominant winds at Huntington, between the first of September 1821, and the first of September 1822. In September, October, November, December and June, the west prevailed. In January, February, March, May, July and August, the southwest; and the east in April.

"Between the first of September 1823, and the first of September 1824, the east wind predominated in the months of September and March; the southwest in October, November, February, April, May, June and August; and the west, in December, January and July.

"The courses of the winds, in the two foregoing years, were north 32, northwest 84, northeast 72, east 100, southeast 43, south 51, southwest 193, and west 155."

See a sketch of the first settlement of Long Island, by the Hon. Silas Wood.

Comparative Table of the temperature at Albany, during seven years, from observations made at the Academy, by T. Romeyn Beck, M. D.

	THERMOMETER.									WEATHER.				WINDS.								
YEARS.	*Mean temperature at 7 A. M.*	*Mean temperature at 2 P. M.*	*Mean temperature at 9 P. M.*	*Mean of all the observations.*	*Highest.*	*Lowest.*	*Greatest daily range.*	*Greatest monthly range.*	*Greatest annual range.*	*Clear days.*	*Cloudy days.*	*Variable.*	*Rain No. of days it fell.*	*No. of days Snow fell.*	*North No. of days.*	*North east.*	*East.*	*South east.*	*South.*	*South west.*	*West.*	*North west.*	*Prevailing Winds.*
1820,	43.24	56.31	47.40	48.98	100	5	36	64	105	122	168	76	87	30	41	6	9	63	89	14	81	63	S.
1821,	42.63	54.52	46.81	47.99	93	14	28	58	107	162	160	43	86	40	35	5	7	59	83	19	90	67	W.
1822,	43.85	56.00	47.69	49.18	90	14	30	52	104	154	135	76	91	22	47	15	2	63	109	4	70	55	S.
1823,	42.04	53.46	46.43	47.31	94	6	30	55	100	149	155	61	67	35	39	9	2	91	60	11	77	76	S. E.
1824,	42.71	54.26	46.69	47.88	89	3	30	60	92	134	131	101	83	19	32	11	1	103	49	25	51	94	S. E.
1825,	44.79	56.97	49.64	50.46	98	6	30	54	104	166	112	87	59	16	60	14	4	46	87	30	45	77	S.
1826,	45.38	56.47	49.68	50.51	92	12	36	65	104	162	108	95	77	23	44½	13	2	60½	84½	34	70½	54	S.

Results.—Mean temperature	
at 7 A. M. for 7 years.	43.52
Mean temperature at 2 P. M.	55.42
" temperature at 9 P. M.	47.76
" of all the observations.	48.90
Highest	100
Lowest	14
Greatest daily range	36
Greatest monthly range.	64
Greatest annual range.	114

Weather.—Clear days in 7 yrs.	1049
Cloudy days in do.	969
Variable days in do.	539
	2557
No. of days rain fell	550
No. of days snow fell	185

Winds.—No. of days North.	301
North East.	73
East.	27
South East.	485½
South.	562
South West.	137½
West.	484½
North West.	486½
Prevailing wind—South.	
	2557

Observations.—From the above Table, it appears, that in seven years, there were 2557 winds at Albany, being one for every day comprised in that period of time. Dr. Beck, we think, is mistaken. He has blended the winds and ranges. Hence, we are unable to learn the number of winds, which blew during the time given. This must be manifest on the slightest view of the subject. The true mode would have been, to have given the winds and ranges in separate columns.

CHAPTER XIII.

WINDS.

In this chapter we propose giving a theory of the winds of New-York. Imperfect as it may be, we think it cannot fail to be interesting to most readers. The winds have great influence on the climate. In point of fact, they constitute a part of the climate of every country.

There are eight winds besides such as are local. The northwest, the north, the northeast, the east, the southeast, the south, the southwest, and the west. Of these three are general, namely, the northwest, northeast, and the east. The southwest is nearly general, pervading the basins of the St. Lawrence, Susquehannah and Hudson, and the valley of the Alleghany. The southeast and south, especially the former, are limited chiefly to the coast of the Atlantic, and the counties situated southerly and southeasterly of the Highlands, or Matteawan mountains; the north is confined mostly to lakes Ontario and Champlain, and the Hudson, and their immediate basins. The west is, we believe, never general. We intend to devote a section to each of these winds.

NORTH WEST.

Section 1. The northwest is the most frequent, constant, and we might add, powerful. It is dry, cold, piercing, elastic and invigorating. It commonly lasts three days; sometimes it continues longer and sometimes shorter. In its movements it is usually rapid. It is of most frequent occurrence, of greatest duration, strength and velocity, in winter and spring, particularly in March and April. It is also pretty frequent in October and November.

This wind, in its march, sweeps the surface of the whole State,

driving before it, and expelling all the other winds. It enters all places, and displaces all other airs. A change in the weather instantaneously follows its irruption and rapid advance. The thermometer will, in ten or twenty hours, sometimes in seven, descend twenty, nay, forty degrees. Every year several of these occurrences happen, The summer months, and the mild months of May and September, are not exempt, although the difference is less. In winter, which is the period when it exerts all its powers, the mercury, in the thermometer, has been known to sink sixty degrees in twelve hours. On such occasions the cold usually attains its maximum, a little after the wind has subsided. In summer the northwest wind sometimes blows with violence, and lasts three days, and has been known to occasion a depression in the thermometer of thirty or forty degrees, in twelve hours.

In its numerous and violent irruptions, during winter, it raises the snow in open situations, and drives it forward, and heaps it along fences, and other obstructions, to considerable heights. This process it continues until it has denuded those places most exposed. The northwest wind is highly detrimental to wheat, rye and meadows, but more especially to wheat, since the surface of the ground is subjected to thawings and freezings, which wound and kill the roots, thereby blasting the expectations of the farmer. The sun, it will be seen, thaws the surface during the day, and the cold during the night freezes it. Hence, there is a succession of thawings and freezings. The former expand, and endeavour to restore the surface of the ground to its natural condition, while the latter contract and harden it. Hence, the roots are loosened, distended, constricted, wounded and killed. In general, its operations are the most destructive in March, and the forepart of April, because the thawings and freezings are of most ordinary occurrence, the sun having returned so far to the north, as to be able to exert considerable strength by day. Then, also the northwest wind, striving with the warmth of the sun, and with the south, southwest and southeast winds, for the supremacy, acts with particular violence. Sudden in its irruptions, and

rapid in its movements, it often, in twelve or twenty-four hours, introduces so much cold, that the ground which had been entirely thawed, freezes to the depth of one or two inches, and winter apparently reassumes his domain.

The northwest wind sometimes blows a gale, and does much damage to vessels. In November 1827, one of these gales did much damage to the shipping at New-York, as was announced in the public papers.

During May, June, July, August and September, the northwest wind generally shows itself after thunder storms and intense heats. Quick in its inceptions, and impetuous in its movements, it changes the weather, causes a rapid evaporation, dries the ground, which had been drenched with wet, and suspends vegetation, or retards it. Its aridity, combined with its density, volume and renovation, is such, that it excites, when it acts with energy, a more copious evaporation than the sun.

It is the northwest wind which opens and paves the way for winter. It is this wind, which, by its frequent recurrence and cold, occasions the ground to freeze. It is this wind which usually occasions rivers, lakes and ponds to be clogged with loose floating ice. It is this wind which introduces and leaves, upon its abatement, a frozen atmosphere, that speedily congeals the surface of the water, and covers rivers, lakes and ponds with strong mantles of ice.

Besides this general northwest wind, there is another, which occasionally ensues after thunder storms and rains, which is limited in extent, duration and intensity. From its suddenness, its limitedness, duration and mildness, we have reason to believe, that it has its origin in the superior atmosphere, or upper stratum of air, and not in the frigid regions of the northwest. In hot weather, the lower atmosphere, or inferior stratum of air becomes rarified, and whenever clouds, or any other ulterior agent disturbs its equilibrium, the cold air above, which is constantly at variance with it, descends and supplants it. In these descents, if the resistance be inconsiderable, the cold air establishes a current, obtains a direction, and assumes the appearance and character of the real

northwest wind, although it is milder. This wind may last one, two or three days, because the store from whence it derives its supplies, affords constant renewals. The extent, duration and force, depend on the ulterior causes and resistance it meets with. Hence, it may occupy a small or large space. The valleys of the Mohawk and Hudson, particularly that of the former, seems adapted to this wind. They are deep, and their atmospheres are covered by colder strata of air. Hence descents.

There is reason to believe that the northwest wind is less frequent, less cold, less violent, and of shorter duration now than it was before improvements were made. The cutting down the forests, draining the swamps and marshes, have exposed the surface of the earth to the direct action of the sun's rays, whereby more warmth has been induced. The lower stratum of the atmosphere has become warmer; mild winds and currents of air have been introduced, which, acting in concert with the genial rays of the sun, mitigate its fury.

The northwest wind is sometimes stormy and attended with rain and snow. In most of these instances, however, it is indebted to the southwest for its supplies. For meeting this wind in the St. Lawrence basin, it either glides over it, carrying portions of its stormy clouds along with it, or displacing it, it drives portions before it, which descend in rain or snow. It also comes in contact with the northeast. In summer it drives before it some of its rainy, and in winter, some of its snowy clouds. In Ohio it is not uncommon for the northwest to be wet. This, however, is occasioned by the vapors which it takes up in crossing lakes Superior and Huron.

NORTH WIND.

Section 2. This wind is the most unfrequent and limited of all the winds. This is, in some measure, in consequence of the configuration of the State, and the Provinces of Lower and Upper Canada. The principal theatres of its operations are the basins of lakes Ontario and Champlain. In the basins of the

Hudson, lakes George, Cayuga and Seneca, the north wind is usually distinct from the true north wind—but more of this hereafter. In May, June, July, August and September, it occurs pretty often in the Ontario and Champlain basins; but it is always weak, not having much energy. The causes inducing it, seem too inefficient to communicate much force or durability to it. Besides, it experiences opposition from other winds and currents. Hence, it never extends far beyond the confines of those waters. The north wind of Lake Ontario is the most considerable in force, extent and durability. It occasionally travels southwardly to the Susquehannah, Alleghany and Chatauque hills, upwards of forty miles, where it is repelled by the cold dense air of those elevated regions, and forced back, or diverted into other directions. It is cold and moist, but seldom stormy. It is agreeable in summer and somewhat bracing. In hot weather it rarely extends over twelve or fifteen miles, and is rather a breeze than a wind. The clearing of the country prolongs the line of its action.

The north wind of Lake Champlain is distinct from the preceding, each having its own basin. Its origin is probably similar. In summer and warm weather, it displays itself oftentimes along this lake, now and then extending to the Hudson, and advancing along its stream. Its properties and characters are very much like those of the north wind of Lake Ontario, differing only in strength.

The north wind along the Hudson is common in warm weather, but it almost always originates from a different source. Its sphere of action is confined to the river and its vicinity. It is feeble and of short continuance.

In the basins of lakes George, Cayuga, Seneca, and Canandaigua, the north wind is common in May, June, July, August and September. The wind of each lake forms a separate system. Each wind pervades its own basin. The winds of these lakes are not connected with those of Champlain and Ontario. We would not, however, be understood to say that those of the latter lakes may not, at times, extend to these collections of water; but the cases are by no means common. These

winds usually rise and fall with the sun. Their scope of action is confined. They are mild and refreshing in hot weather, and desirable. In winter, the character of this wind changes, but it is not common in these basins.

The north winds of lakes Champlain and Ontario, are sometimes portions of the northeast, diverted from the basin of the St. Lawrence. These, however, are readily distinguished from the true north wind, by their being colder, more moist, stronger, and of greater duration. The north wind, as we have before remarked, is never general, but always confined to particular tracts of country.

NORTHEAST WIND.

Section 3. This wind is very common on the Atlantic coast, and in the basin of the St. Lawrence. It now and then displays itself in the interior, when it becomes general, and spreads over the whole State. It originates in the arctic circle, or contiguous to it, and crosses the northern Atlantic ocean, to this continent. On the coast, and in the St. Lawrence basin, it is wet, cold and impetuous, but in the interior, it has less humidity, and less impetuosity, having parted with some portion of the former, in crossing the mountains, and having lost much of the latter by the resistance of the mountains. It generally lasts two or three days; now and then longer. In winter it brings snow, and in summer, rain; in spring and autumn it brings both, now one, and then the other. On the coast, it bears along with it, the coldest and most distressing storms of all the winds. Hardly a year passes without three, four, or more of these storms, which usually continue three days, and extend southwestwardly as far as Georgia, or the Mexican sea. In winter, the snow will occasionally fall to the depth of a foot or eighteen inches, on the coast, and as far back as the mountains, while not any will fall behind the mountains, unless it be in the St. Lawrence basin. When, however, this wind is general, it snows in the interior as well as on the coast, and in the basin of the St. Lawrence, but the snow does not fall so deep. In the latter basin, the north-

east is not so humid, violent and stormy as it is on the coast, owing to its want of volume, and the obstacles it has to encounter in its progress.

The character and properties of the northeast wind change as it advances towards the torrid zone, in consequence of its mixing with warm air, and in consequence of its parting with its moisture in its progress. In the interior, it is much drier than it is on the coast, and in the St. Lawrence basin, and the basins of lakes Ontario and Erie. In the latter basins, it acquires moister in its way over those large expanses of water. In the northeasterly parts of Ohio, and those parts of Virginia and Pennsylvania, between the mountains and the Ohio and Alleghany rivers, it is often dry, elastic, and bracing, and not unlike the northwest, though it has not so much strength. In both the cases cited, it has parted with most of its moister.

The northeast is much less habitual on the coast, and in the St. Lawrence basin, during May, June, July, August and September, than during the other months. The northeast wind is the most violent and tempestuous about the time of the vernal equinox, and in the month of October, especially on Lake Erie. Here, at these times, and not unfrequently on the coast, it displays great fury in limited districts—perhaps in consequence of the opposition it experiences from the southwest, south, and southeast winds, which also blow furiously at those times. Lake Erie furnishes one of these districts, and the coast of the Atlantic, several. We are not in possession of sufficient data to form a correct opinion, in relation to the particular causes. Hence, we are under a necessity of resorting to some conjectures. First, as to Lake Erie:—this lake is situated nearly midway between the Northern Atlantic ocean, and the Mexican sea, whence the northeast and southwest winds take their rise and departure. Second, these winds meet on this lake, where they contend violently for the mastery.

Like two hostile armies, the one will gain an advantage in one quarter, and the other in another, while perhaps the advancing columns will be balanced, or so nearly so, that portions rise and assume new directions, or else the one obtains

a momentary advantage, which its antagonist soon recovers, and compels it to fall back. Hence, calms, tardy movements, impetuous movements ensue in a small space, and in very short periods of time. The wind, in one of these spaces, will either blow in a steady gale, or with fury, while in another, owing to the equilibrium of the currents, it will be apparently still. Hence, the wind, in two or three hours, will shift to every point of the compass. At such times the lines of movement seem to be controlled by circumstances, and act in unison with the advancing and retiring masses. In these contests, the southwest wind almost always comes off victorious, and compels the northeast to retreat: sometimes pursuing it as far as the Gulf of St. Lawrence, or the borders of the ocean adjoining that gulf. The St. Lawrence and Mississippi basins are flat and low at their mouths, more particularly that of the latter. They, however, rise imperceptibly, and attain considerable elevation, perhaps seven hundred or eight hundred feet at the line of contact. Both basins have mountanious barriers on one side. The former has its barrier on the southeast, and the latter on the same side. The barriers, on ordinary occasions, confine the winds to two channels. The opposite banks of these basins consist, in great part, of elevated plains or regions, with rolling surfaces, which rise westwardly and northwestwardly, and act like mounds. The northwest, on that side, also tends to confine them, being the enemy of both. Hence, these winds are pent up in a narrow space.

We have said that the northwest wind was the common antagonist of the southwest and the northeast. We shall endeavour to elucidate it. The northwest wind originates in the elevated parts of the continent, at a point intermediate to those of the others. In its progress it comes into contact with both; its course being directly across their lines. Hence, it drives in those winds, and prevents them from spreading much on that side. Hence, it will at times displace both, or pass over them, carrying along with it portions. Hence, the cause of its being rainy or snowy. When the southwest, however, is not opposed by the northeast, it usually prevails, and it is the same with the northeast at times.

The tempests on the coast are probably occasioned by the resistance which the northeast receives from the southeast, south and southwest, and the form of the coast.

EAST WIND.

Section 4. This wind is common to all the Atlantic coast, from Hudson's bay, to the confines of Georgia. It is also not unusual in the interior, although by no means as frequent as it is on the coast. It is distinct from the trade-wind, which blows between and near the tropicks, this being regular. The east wind, coming immediately from the ocean, is wet, cold, and often very strong on the coast. In the interior it blows with less strength, chiefly in consequence of the opposition it encounters in its passage over the mountains. It is also less wet and stormy. Its duration and power are less than those of the northeast. Its advance is steady. In summer it rarely crosses the mountains. In autumn, winter and spring, it every now and then surmounts them, and progresses as far as Upper Canada, &c. On these occasions it is accompanied with rain or snow, the former being in autumn and spring, and the latter in winter. The falls of rain and snow are the greatest on the east side of the mountains, and the least in Canada. The quantities diminishing very gradually all the way. More falls in the eastern part of the State than in the middle, and less in the western than in the latter. The east wind is general. The east wind now and then blows, without disturbing the air, in the basin of the Hudson proper. At such times it, after crossing the mountains of New England, glides over the atmosphere of the valley, and reaching Kaatskill and Sacondaga mountains, pursues its way over their elevated summits.

In the valley of the Mohawk, and along Oneida Lake, there are east winds which may be called local. They have no connection with the real east wind. That of the Mohawk valley is occasioned mainly by the diversion of a portion of the south wind, which blows along the Hudson. The diversion is induced by the mountains, which nearly environ the upper part

of the basin of that river, and the configuration of the valley. This wind does not assume a westerly direction, before it has proceeded about twenty-five miles westwardly of the Hudson. Along that river, for eighteen or twenty miles west, it is south; then southeast, and lastly east, or as near that direction as the valley will allow. This wind is much more frequent than the east, since it almost always blows, when there is a considerable irruption of the south or southwest winds, into the basin of the Hudson. It is distinguishable from the east wind by its being milder and more imbecile.

This wind, we have on several occasions, traced to and from its source. We shall narrate two instances. In the one, we travelled from Charlton, in the county of Saratoga, eight miles north of Schenectady, to Palatine church, a distance of thirty-four miles, in a direct line; and in the other, from Fall Hill, in the county of Herkimer, to the city of Albany, a distance of seventy miles. In both instances, we set out early in the morning. In the first, the wind was due south, and had been for twenty-four hours or longer. It blew with considerable force, and there were strong indications of rain. At first our course was northwesterly, to the borders of Montgomery, and then westwardly to Palatine. After reaching the Montgomery border, we found the wind southeast, and soon after east, which direction it kept to Palatine. At Johnstown and Palatine, we believe the south wind never blows, or if it does, it is merely a gentle breeze from the hills. Besides, we made enquiries at both places, and were informed, that the wind had been east more than twenty-four hours.

In the second, the wind came from the east. It was in March, and we travelled in the stage. The sleighing being very good, we reached Albany in rather over nine hours. The wind was at first weak and rather chilly, and was attended with some sleet. As we proceeded, it became stronger, moister and warmer. Instead of sleet, rain fell but sparingly. After reaching Amsterdam, it became southeast, and in the vicinity of Schenectady south, and so to Albany. Shortly after our arrival at the latter place, it abated, and the valley of the Hudson was

presently enveloped with fog. On enquiry we learned that it had been south at Albany, for nearly three days, and that considerable rain had fallen that day and the preceding night. The snow had experienced a great reduction. It was otherwise in the Mohawk valley above Amsterdam. There the wind, confined to a narrow space, and mixing with the air of the valley, had not enough of warmth to occasion much diminution.

The east wind of Oneida Lake, seems to be occasioned by the contiguous air advancing upon the air of the lake, and producing a current which sets westwardly. The order is often reversed, and the wind blows easterly. Indeed, nothing is more common in warm weather than east and west winds on and along this lake. Their scope of action will be enlarged when the country around the lake is cleared. These winds are light and moist.

On the west side of Lake Champlain, a local east wind is quite common. In summer it rises and falls with the sun. It advances into the level parts of Clinton, as improvements are made. It is rather a breeze, induced by the lake, than a wind. There is a land breeze in warm weather, which is westerly. It often rises on the other's falling. In Vermont, the westerly breeze from the lake, resembles the eastern, and *vice versa.*

The same kind of winds, are of ordinary occurrence, at Sacketts Harbour, and around the easterly end of Lake Ontario, in warm weather. These, as well as the preceding, are occasioned by different temperaments in the atmosphere over the land and over the lakes.

SOUTHEAST WIND.

Section 5. The southeast wind is not very common. It is confined mostly to the Atlantic counties. It is now and then stormy, and at other times not. Ordinarily it is light, and rather warm. It blows with most strength and impetuosity, about the time of the vernal and autumnal equinoxes, producing at the mouth of the Hudson, and some other places, tempests.

These tempests are, however, limited. They are not confined to the coasts of this State, since they occur at Boston or Massachusetts, Delaware and Hudson's bays, and other places. The southeast wind now and then crosses the Highlands, or Matteawan mountains, and those of New-Jersey and Pennsylvania, and displays itself in the basins of the Hudson and Susquehannah. These basins, although partially invaded by it, seem to limit it in some measure. It never surmounts the mountains, unless it has great force on the coast, as well as duration.

The southeast, sometimes like the southwest, becomes a southwest wind along the Hudson, but it is ordinarily imbecile after it has passed the mountains. This arises from three causes, the direction of the valley, the contraction of the torrent at the mountains and its subsequent diffusion. Air or winds, like water, contracts and expands according to the channel which it flows in. The southeast wind is not unusual at Skaneateles, in the county of Onondaga, and at Auburn, in the county of Cayuga. Snow or rain often comes from those quarters. The southeast wind is by no means uncommon in Chenango and Courtland, as well as portions of these counties; but we suspect after all, that it is not in truth the southeast, but the east diverted. Subsequent observations must, however, determine this. We do not offer a perfect theory of the winds. The utmost we propose is a contribution of our mite in the scale of science. To construct a perfect theory, it would be necessary to have simultaneous observations of all the winds, which cannot be expected, unless made under the superintendance of government.

SOUTH WIND.

Section 6. The south wind, strictly speaking, is not very common in this State, although winds holding that course, are in the basins of the Hudson and Susquehannah, or at least in certain portions of the latter basin. In the former basin, the wind which becomes south, and which we distinguish by that

appellation, is southeast, south or southwest, till it has reached the Highlands, or Matteawan mountains. The first and last never assume that character perfectly, before they have passed those mountains; then, and not till then, do they take upon themselves that designation. To point out each wind, and draw a line, is not easy. We shall, however, endeavour to treat of the south wind, in the first place, and then of the southwest diverted.

The south wind, which is not very common, when it does blow, generally extends north as far as Lake Champlain, and now and then to the St. Lawrence, pervading, not only the basin proper of the Hudson, but that of Lake Champlain. After it has reached the central and northern parts of the plains and champaigns of the Hudson, it detaches some branches which ascend certain valleys that open into that river. One of these branches ascends the valley of the Mohawk, and becomes an easterly wind. This wind we have already spoken concerning. The mountains lying around the head of Lake Champlain, it would seem, induce these diversions. The south wind, on reaching them, is repelled and compelled, in certain respects, to take different courses, and then to move in different channels, with diminished velocities. The main torrent, however, goes on northerly through the narrow bed of Lake Champlain, to Crown Point, where it again spreads. This wind, in its progress, has two main diffusions; the one over the plains and champaigns of the Hudson, and the other on the broader parts of Lake Champlain. A greatly increased action occasions more extensive diffusions. Inequalities in the surface occasion retardations and accellerations in the ærial torrents.—Hence, the same wind will, at one time, advance with a strong steady pace, and at another with impetuosity. The Hudson and Champlain basins are connected by a narrow strait. This strait is between south bay and Ticonderoga. The south wind originates in or near the torrid zone, and reaches New-York, after having traversed a broad portion of the Atlantic ocean. It is strong or weak, according to the primary cause, and the obstacles it has to encounter, which are inconsiderable, unless

opposed by adverse winds. Its attendants are heat and moisture. Its continuance is usually from one to three days. In winter its inroads produce heavy thaws, that not unfrequently sweep away the snow from the lands adjoining the Hudson, and now and then back to the mountains. Then it not unfrequently advances northerly as far as Lake Champlain, and its outlet, inducing thaws as far as Canada, but they are more imbecile than along the Hudson, owing to its admixture, diminution, and other causes. These thaws are the heaviest below the Highlands, weakening as the wind advances.

When the south wind is strong, and attended with rain, two or three days are sufficient to dissolve the snow, and in certain instances, to break up the Hudson. It generally blows several hours, and sometimes for a whole day, before the rain begins to fall. These thaws are the most violent along the channel or line of the stream, diminishing as they recede from it. There is reason to conclude, that this wind has increased in its sphere of operations, and that it occurs oftener now than it did in former times, consequences induced by the clearing and improving the country.

The south wind occurs in the Susquehannah country in several places. The Chenango and Unadilla valleys, and the basin of Otsego lake, may be cited as examples. Whether it is ever general in this portion of the State or not, we are unable to say. The same wind blows in the Oriskinney, Oneida, Chitteningo and Onondaga valleys.

Dr. Josiah Noyse, Professor of Chemistry, at Hamilton College, in the county of Oneida, in a conversation, informed me, that not only the south, but the southwest, were common at Hamilton, on Oriskinney. The south wind in these valleys, although it has not the warmth that it has in the valley of the Hudson, has enough to induce temporary thaws in winter. Rain often attends it. In its descent, from the declivity of that part of the Osquake hill, lying north of Otsego lake, it does not descend into the Mohawk valley, but either rises, glides over it, or bends, and takes the direction of the superior air of the valley, which is ordinarily east southeast.

We beg leave to relate an occurrence which we witnessed, in regard to the south wind at this place, and also that of the valley. We left the village of Herkimer in the month of November, about seven in the morning, for Warren, distant eight miles, in a southerly direction. The wind, in the valley, was from the east, and accompanied with considerable rain. As we approached the foot of the declivity of the Osquake hill, the rain subsided, and was followed by a mist. The ground, from the foot of the hill, southwardly, was covered with snow, which increased as we ascended, till we reached the sources of the Susquehannah. There was no snow in the Mohawk valley. The foot of the declivity is 800 or 900 feet above the ocean. While passing from the foot of the declivity, to the extreme sources of the Susquehannah, we were met by the south wind, which came from Otsego lake. This wind was attended with some rain, and had blown for twenty-four hours, as we were told by persons of undoubted veracity. Towards evening we returned to Herkimer, the wind still blowing from the south, as it had in the morning. The east wind also blew in the valley. The south wind does not blow in the valley of the Mohawk, at Herkimer, although the southwest does. The south wind blows in Broome, Tioga, &c.

Along Cayuga, Seneca and Canandaigua lakes, the south wind is very common in warm weather. Each lake has its own particular south wind. Each wind has its origin in the atmosphere of the hills around the heads of these lakes. These winds are cool, in as much as they derive their supplies from the superior region, and not from the torrid zone. All these winds have extended, since the woods, in the vicinity of the lakes, have been cut down.

SOUTHWEST WIND.

Section 7. This wind, although it pervades upwards of two-thirds of the State, at times cannot be called general. Its principal fields of action, are the basins of lakes Erie and Ontario, and those of the St. Lawrence, Susquehannah and Hud-

son, to which may be added, the valley of the Alleghany. It comes from the Mexican Sea, and is in the first instance, we believe, a south wind, whether it is on the east or west side of the Alleghany mountains. That branch which pervades the lakes and St. Lawrence, comes up the Mississippi, while that which pervades the basin of the Hudson, traverses the flat country between the ocean and the mountains. That of the Susquehannah is probably derived from both. The branches of this river are extended. The shape of the Mississippi basin, and the country between it and Lake Erie, the mountains, and the form of the flat country adjacent to the ocean, seem to control the directions. The mountains commonly separate the two ærial streams, and confine them to the coast and the western country. When, however, these are unable to do this, it pervades the Alleghanies.

The southwest wind is commonly warm, sometimes hot, and ordinarily stormy, bringing rain, thunder and lightning. It generally lasts two or three days. Along the lower Mississippi, and in the southern States, bordering the ocean, it is said to be much more common than it is in this State. It is also said to be much more stormy. We have remarked, that the southwest wind usually comes to this State by the way of the Mississippi, and the coast: we shall therefore treat of these branches, first beginning with that which blows in the Hudson and southerly of the Highlands.

The southwest wind blows frequently below the Highlands. It reaches this State after having traversed the flat country, and the borders of the ocean. In the basin of the Hudson it does not in reality, become south before it has passed the Highlands. Then from the course of the river, and the peculiar configuration of its basin, and the mountains which nearly enclose it, it assumes a southerly direction. When strong and of usual continuance, it transcends the limits of its basin on the north, and enters that of Lake Champlain, and pursues its way through to Lower Canada. It has two principal diffusions, the one in the broadest part of the basin of the Hudson, and the other in the broadest part of that of Lake Champlain. In its advance it be-

comes weaker, after it has crossed the Highlands. This wind, like the south, has its collaterals. One of these ascends the valley of the Mohawk, taking upon itself a direction in unison with that valley.

The southwest wind, which is so prevalent in the St. Lawrence basin, reaches Lake Erie on the side of Ohio. Its characters are similar to that of the coast, only it blows with more force. It is this wind which renders our western and northwestern counties milder than those along the Hudson and Lake Champlain, in the same parallels of latitude, and gives the climate a very different character. The southwest wind, about the summer solstice, occasionally lasts eight or ten days. It is then rather feeble than otherwise. In warm weather it may be said to possess considerable mildness, in consequence of its not experiencing much resistance from the northeast and northwest, its antagonists. In March and September, about the time of the equinoxes, it is not uncommon for it to blow with violence, and be accompanied with rain, thunder and lightning. On Lake Erie this wind is far more violent than it is on Lake Ontario. Almost every year, between the eighth and twenty-fifth of October, there is a tempest on this lake; some years, two or three in the course of the month. The squalls and gusts which ensue during these tempests, often occupy small spaces, and are short in their duration. They occur in various parts of the lake, in the course of the same storm, and even hour. No place seems to be entirely exempt from them. Almost every year accidents happen, in this month, to vessels. We have already made some suggestions in relation to the causes. We have supposed that they were occasioned by this wind's meeting the northeast, and the northwest, and coming in contact with both. The volume of air brought by the southwest wind, at these times, is very copious, perhaps more so than at any other time in the year. In these contests, the southwest almost always vanquishes the northeast, and drives it back, and pursues it down the St. Lawrence, to Montreal or Quebec. The southwest wind, whenever it is violent, and of considerable duration, rises and spreads, showing itself, not only in the

flat countries around lakes Erie and Ontario, and along the St. Lawrence, but also in those of the Alleghany and Susquehannah. It extends even to the Mohawk, and crosses Fall Hill and the Osquake. We have witnessed this wind on lakes Erie and Ontario, along Niagara river, on Genesee river, at Canandaigua, in Ontario, at Auburn, in Cayuga, at Skaneatelis, and other places in Onondaga, and in Madison and Oneida.

The southwest wind occurs every now and then in November, December, January, February and March. In these months it usually advances beyond the outlet of Lake Ontario. Then its duration is two or three days. On its first reaching the great lakes, it is often feeble and tardy in its movements, on account of the resistance it meets from the northeast and northwest, and the frozen air pervading the basins of the lakes: but as it advances and continues its operations, it acquires strength, volume and rapidity, and when it has once cleared the way, it displays its energies and powers. Wet, warm and rapid, it discharges torrents of rain, sweeps of the snow, thaws the ground, and brings along with it the warmth of spring. The mercury, in the thermometer, will ascend to sixty or seventy degrees. Between lakes Erie and Ontario, and around the latter lake, it dissolves the snow in a few hours. These parts are in the channel of the ærial torrent. East and west of this channel, its effects are less. This we have noticed in travelling eastwardly from Buffalo to Utica, in the county of Oneida, a distance of two hundred miles. It was in the month of February. Its effects at Genesee river were less than at the Niagara, and greater than at Auburn, in the county of Cayuga. From Auburn to Utica they gradually lessened. They were also less twenty or thirty miles south of Lake Ontario, than on its borders.

Like some of the preceding winds, the southwest diffuses itself more widely as the woods are cut down. In the Mohawk valley, it often becomes a westerly wind, conforming its course to that of the valley. The Oneida and Seneca vale, and the champaigns, facilitate its direction, since they are in a line

nearly corresponding with it. It is known from the west wind by its volume, warmth and rapidity, and also by its irregularity.

The south west wind almost always blows on the coast when it does in the basin of the St. Lawrence. At such times the branches, which these winds detach, meet at Anthony's Nose, Fall Hill, or some other place, where they contend, but the St. Lawrence branch usually prevails.

WEST WIND.

Section 8. The west wind is the mildest and most agreeable of all the winds. It is never general. It prevails most during warm weather. The western country is its principal theatre; it occupying the space between the hills and Lake Ontario, and around the eastern end of that lake. The west wind prevails more or less in the basin of the Hudson, and along the Atlantic coast. It is also found in other places. In each place it constitutes a system. The west wind is never general, nor of long continuance. Sometimes it will blow more or less every day, for weeks. The west wind's sphere of action has increased since improvements have been made. The west wind is not uncommon in some of the other months.

Thunder and Lightning.

These occur frequently during the summer. In April, May, September and October, they are not common: they rarely happen in the other months. The storms of thunder, which occur in summer, are sometimes violent, and are often attended with the loss of lives and buildings. Every year instances happen of persons being killed, and buildings burnt. The operations of the igneous matter, however, do not, after all, seem to depend so much upon the quantity with which the clouds are charged, as they do upon some determinate state of the atmosphere, preparatory to, and during the discharges. But what this state is, we cannot say. Accidents are, however, more usual, when the inferior air, or that in which the clouds move,

is greatly rarified and heated, and when the clouds move near the earth, than at other times.

There are two kinds of thunder storms, namely, general and partial. The first are rare, but then they last much longer. The second originate in particular districts, and in general are limited in extent, seldom lasting over an hour. The former come from the southwest or northwest. Those from the southwest prevail mostly in the St. Lawrence, Susquehannah and Hudson basins. They happen in winter as well as in summer, and have less violence. Those from the northwest are induced, it is probable, by portions of stormy clouds being diverted from the St. Lawrence basin, by the northwest wind. We have known some of these extend across the whole State.

The latter, or those of limited extent, occur in every part of the State, although not with the same violence. They are usually more frequent and violent in the hilly and mountainous districts, than in the open country. In some of the latter districts, and those adjoining them, the aqueous and igneous matters gather in half an hour or an hour, and then moving in some particular direction, discharge their contents. In 1819 one of these storms happened at Catskill, and its environs. It lasted over five hours, during which time an average depth of fifteen inches of water fell. The sphere of its action, after the cloud had become stationary, or nearly so, did not comprise an area of more than seventy or eighty square miles. The brooks and streams rose to an alarming height. In some, broad beds were formed, while in others, they were greatly enlarged. In some places it seemed as if the cloud had broken and discharged its contents at once; trees, soil and loose stones were entirely removed from hill sides and precipitated below. The thunder, during the whole shower, was incessant and very loud, and the lightning copious and excessively vivid.

In the same year, there was one in the county of Herkimer, on the east side of Fall Hill, but it was not so long and violent, its continuance being only two hours. The cloud occupied an extent of nine or ten miles in length, from south to north, and six or seven from west to east. Two clouds met on the east

side of Fall Hill. The one came from the southwest, and the other from the northwest. The valley seemed the line of contact. A momentary calm ensued, and then the rain began to descend. The hill torrents swelled to extraordinary sizes. The Nowadaga creek, whose source is on the Osquake hill, distant seven or eight miles, rose higher than it does in spring. A small stream on the north side of the river, whose length is not over three miles, swelled so much, as to overflow its banks at the road, which it had never been known to do before. It uprooted trees, swept away fences, and opened a new way to the river. Those clouds gathered suddenly, and then moved rapidly, till they met. Fall Hill formed a line on the west. No rain fell on its summit, or west of it, and very little on its eastern declivity, although it descended in streams two miles east. The thunder was very loud. The weather had been hot, and there had been no rain for some weeks before.

Similar showers occur every year in the hilly and mountainous districts, differing only in violence and duration. Preparatory to these showers, vacuums are often formed into which the clouds descend from the higher regions.

Meteors.

These are not very frequent. Those denominated shooting stars are occasionally seen.

The aurora borealis is every now and then seen, but is seldom brilliant.

We shall give an account of a meteor of a very different kind, which, from its magnitude and brilliancy, excited considerable notice at the time.

On the ninth of March 1822, at about ten o'clock at night, a very large and very brilliant meteor passed a little south of the town of Herkimer, in the county of Herkimer. Its direction was nearly from east to west. It moved through the atmosphere in a horizontal line, with inconceivable velocity, appearing like a large luminous ball, and leaving behind it a trail, several hundred yards in length, which gradually faded

and disappeared. The light which it emitted, in its simultaneous transit, was so copious and resplendent, that it seemed for some moments to equal, if not surpass, that of the sun at noon-day. At the instant of its evanescence in the western horizon, it seemed to explode. About two or three minutes afterwards, a loud report, resembling that of a cannon at some distance, succeeded by echoes and reverberations, was heard in the south. The sky, before and at the time of its appearance, was clear and tranquil, not a haze or cloud were to be seen. The full moon shone with all its splendour.

Immediately, however, after its evanescence, and the disappearance of the light which it had emitted, the atmosphere became hazy, and assumed a dusky hue, which lasted some time. Such are the results of what we saw, and of our observations. We shall pass to those of others, and then close with some remarks.

On the thirteenth of March, we saw an acquaintance, who was, on the same evening, in the county of Otsego, at a place called the Butternuts, and distant from Herkimer about forty miles, nearly in a southwesterly direction, who informed us that he saw a very large ball of fire pass rapidly through the heavens, from east to west, some where about ten o'clock. That it moved horizontally, and passed north of where he was. That the emissions of light were nearly, or quite, as great as those of the sun at mid-day. The sky was clear and calm, and the moon shone with her accustomed splendour.

In the course of a few days after its appearance, we learned from the newspapers, and other sources, that it had been seen at the sametime at Palatine, Canajoharie, Johnstown and Amsterdam, in the county of Montgomery; at Cherry Valley, in the northern part of Otsego county; at the city of Albany, in the county of that name; at Troy, in the county of Rensellaer; at Northampton, on Connecticut river; in the State of Massachusetts, at Boston and Salem, in the same State; and several other places in New England; at Utica, in the county of Oneida, in the State of New-York; at Onondaga, in the county of Onondaga; at Geneva and Canandaigua, in the county of On-

tario; at Rochester, on Genesee river, in the county of Munroe; at Buffalo, near the outlet of Lake Erie, in the county of Erie; at the outlet of Lake Ontario; at Montreal, in the Province of Lower Canada; at Hudson, in the State of New-York, thirty miles south of the city of Albany; at Poughkeepsie, in the county of Dutchess, in the same State; and in various parts of the State of Pennsylvania, &c.

We shall add some extracts which we made from some of the public papers, which disclose the same, or nearly the same phenomena, throughout the whole line it was seen to move in.

"About ten o'clock at night, a luminous ball, of uncommon size and brilliancy, and nearly as large as a barrel, emitting sparks on all sides, was seen passing over the city of Albany, from northeast to southwest."—*Albany Gaz. March* 15, 1822.

"On the evening of the ninth of March 1822, about ten o'clock, a large globular fire ball, uncommonly luminous, was seen passing over the village of Cherry Valley, with great velocity. Its direction appeared to be from northeast to southwest. It gave out large sparks, and left a long train in its rear. A few minutes after its disappearance an explosion was heard."—*Albany Gazette*, ibid.

"A gentleman who saw it at the town of Canajoharie, described it as being of vast magnitude, and as emitting light so abundantly, that the atmosphere appeared lighter than at noonday."—*Albany Daily Advertiser*, ibid.

At Salem, in the State of Massachusetts, it is described as having had the same appearances, and to have moved in the same direction.

Several of the newspapers printed in the western counties of this State, corresponded in the accounts which they gave, with what we saw, and what the Albany and eastern papers related.

From some of the papers printed in the State of Pennsylvania, it appears to have passed north of that State, and to have been of less magnitude, and to have afforded less light than it did here.

By the descriptions contained in the Montreal papers, it

was seen south of that city, and moved westwardly, and was less luminous, and not so large as more southerly

According to the accounts which were given of it at Ogdensburg, in the county of St. Lawrence, sixty miles northeasterly of the outlet of Lake Ontario, and at Sacketts Harbour, in the county of Jefferson, at the east end of the same lake, it passed to the south, and was exceedingly large and splendid.

At Poughkeepsie, in the county of Dutchess, it was seen to the north, and was very large and luminous, and cast off sparks on all sides.

The New-York city papers represent it as having moved from southwest to northeast, and north of that city; but, notwithstanding these representations, we have no hesitation in avering, that the writers of the articles in question, where wholly mistaken, and could have seen nothing more than the trail it left in its instantaneous passage.

The space comprised within the above limits, if we include a small portion of the ocean, in order to give it a square form, contains an area of upwards of 200,000 square miles.

The distance from Salem, in the State of Massachusetts, to Buffalo, in the State of New-York, near the outlet of Lake Erie, is upwards of four hundred and fifty miles, and from the city of Montreal, in Lower Canada, southwardly to latitude thirty-nine degrees and thirty minutes, upwards of four hundred. But this region only comprises the country from which we have obtained accounts. How far it had come before it had arrived at Salem, and how far it proceeded after it had passed Buffalo, are unknown. There is, however, very little doubt, but it traversed twice or thrice the distance which we have heard from, and had a similar brilliancy and magnitude all the way.

Again, as it was large and luminous, both in Lower Canada and Pennsylvania, it must have been visible some way north and south from those places which we have named.

This meteor must have had considerable altitude, otherwise it could not have been seen over so extensive a region.

We shall conclude with some observations, which we deem not altogether irrelavent to the subject.

1. We think, notwithstanding several of the accounts represent it to have moved from northeast to southwest, that it must have moved from east to west, or very nearly so. The accounts from Albany and Cherry Valley, say it passed over those places. The person who saw it at the Butternuts, in the county of Otsego, informed us that it passed north of that place. At Utica, in the county of Oneida, at Herkimer, in the county of Herkimer, and at Palatine and Amsterdam, in the county of Montgomery, it was seen in the south. The distance from Albany to Utica is about ninety miles in a straight line, but Utica is thirty miles, nearly half a degree further north than Albany. A due west line, therefore, from the former place, would pass thirty miles south of the latter. Cherry Valley is about fifty miles nearly due west of Albany, and the Butternuts about eighty miles southwest. The latter place is nearly, or quite twenty minutes south of the latitude of Albany. Hence, had it moved over the city of Albany, in the direction mentioned, it would have passed south of Cherry Valley, and a little south of the Butternuts. Again, it is described as having passed over the counties of Onondaga, Cayuga, Seneca, Ontario, &c. which are all situated westwardly of the city of Albany. A line drawn southwestwardly from that city would not touch either of those counties—it would leave them all to the northwest.

2. Albany is very nearly west of Salem, in Massachusetts, and Buffalo is nearly west of Albany. Salem and Buffalo are about four hundred and fifty miles apart. A due west line drawn from the former, would strike some place very near the latter.

CHAPTER XIV.

ZOOLOGY.

ZOOLOGY constitutes that branch of natural history which relates to animals. Linnæus divides the animal kingdom into six classes, the characters of which are taken from the internal structure of the being treated of.

Each of the classes of animals is subdivided by Linnæus into different orders, &c.

The First Class—denominated mammalia, from the female's suckling its young, comprehends all viviparous animals, with warm blood.

These, with few exceptions, have teeth fixed in their jaw bones; and from the form and number of these teeth, the orders are distinguished, except that of cetaceous fishes, which is known by the fins that are found in the place of feet.

The first order of primates contains man, monkeys and bats.

The second order, called bruta, among others, contains the elephant, the rhinoceros, the ant eater, the ornithorinoceros, &c.

The third order, called feræ, contains the seal, the dog, the cat, the lion, the tiger, the panther, the weasel, the mole, and most beasts of prey; the kangaroo and opossum belong to this order.

The fourth order, called glires, comprehends beavers, mice, hares and squirrels.

The fifth order, pecora, comprehends camels, sheep, and horned cattle.

The sixth order, belluæ, comprehends the horse, hippopotamus, and the hog.

The seventh, and last order, contains cetaceous fishes, or whales, &c.

Second Class—Birds, which constitute this class, are divided according to the form of their bills, into six orders.

The first order is denominated accipitres, and comprehends eagles, vultures, hawks, &c.

The second order is called picæ, and comprehends crows, jackdaws, parrots, humming birds, &c.

The third is called anseres, and comprehends ducks, swans, gulls, &c.

The fourth order is called grallæ, and comprehends herons, woodcocks, ostritches, &c.

The fifth order is called gallinæ, and comprehends peacocks, pheasants, hens, turkeys, &c.

The sixth, and last order, is called passeres, and comprehends sparrows, larks, thrushes, doves, &c.

Third Class—Amphibia constitute this class. Their blood is little warmer than he surrounding medium. They are divided into two orders.

The first order is called reptilia; as the tortoise, the dragon, or flying lizard, the frog, the toad, &c. All these have four feet.

The second order is called serpentes. These have no feet. Most serpents are without fangs. Those having fangs, as the rattle snake, &c. are poisonous, but those without, as the black snake, &c. are not.

The animals constituting the third class, can live for some time without respiration, since the whole of their blood does not pass through the lungs.

The preceding classes have lungs for respiration, and receive air by the mouth, &c.

Fourth Class—This class comprehends most fishes, and is subdivided into six orders. Four of these orders have regular gills, supported by little bones, and are distinguished according to the place of their central fins, into apodes, as the eel and lamprey; jugulares, as the cod; thoracici, as the sole and perch; and abdominales, as the salmon pike, &c.

The two remaining orders, called branchiostigi, and chondropterygii, are without bones in the gills, the one being soft

and the other cartilagenous, or gristly. The sun fish, the lump fish, the fishing frog, the sea horse, &c. are of the former, and the sturgeon, skate, shark, &c. of the latter order.

Fifth Class—This class comprehends insects, and is divided into seven or more orders.

The first order is called coleoptera; the second, hemiptera; the third, lepidoptera; the fourth, neuroptera; the fifth, hymenoptera; the sixth, diptera; the seventh, aptera, &c.

The first have hard sheaths to their wings, and are generally called beetles.

The second have sheathes of a softer nature; these are called grasshoppers, bugs, plant lice, &c.

The third have dusty scales on their wings, as butterflies, moths, &c.

The fourth have transparent wings, but no stings, and are called dragon flies, May flies, and other flies, &c.

The fifth have stings, which are either poisonous or not, as bees, wasps and ichneumons, &c.

The sixth have two wings, as common flies, gnats, &c.

The seventh are without wings, and comprehend crabs, lobsters, shrimps, prawns, spiders, scorpions, millepedes, antipedes, miles, &c.

Sixth Class—These are called vermes, and are the lowest of animated beings. This class is subdivided into five orders.

The first order is called intestina, as earth worms, and ascarides.

The second order is called mollusca, such as the dew snail, the cuttle fish, the sea anemone, and the hydra, or fresh water polype,

The third order is called testacea, and comprehends all animals with shells of one or more pieces. Most animals belonging to this order inhabit the ocean, and are denominated shell fish. The limpit, the periwincle, the snail, the musle, the oyster, the barnacle, &c. may be enumerated.

The fourth order called zoophyta, contains corallines, sponges, and other compound animals, united by a common habitation, which has the appearance of a vegetable.

The fifth order is called infusiora. It is scarcely distinguished from the intestina and molusca, than by minuteness and spontaneous appearance, in animal and vegetable infusions.

The following tables contain the names of the quadrupeds, birds, amphibia, fishes, &c. of the State of New-York, so far as they are known to us. We have noted such as have been imported. In the class, mammalia, our arrangement of the orders is not scientific, but this was unavoidable :—

CLASS I. MAMMALIA.

Order 5.—Pecora.

Black moose	Cervus alces niger
Grey moose	Cervus alces cinereus
Elk	Cervus wapite
Deer	Cervus

There are two varieties of the moose, the grey and the black; both are indigenous.

Carribou, or rein deer	Cervus

The carribou is not, at present, an inhabitant of this State—he is found in Maine, Canada, &c.

Order 3.—Feræ.

Panther, or ounce	Pardus, aut panthera
Lynx	Felis lynx, aut lupus cervarius
Wild cat	Catus ferus, felis fera, aut catus cervarius
Black cat	Catus niger
Black bear	Ursus Americanus
Black bear with short legs	Ursus brevis crus
Wolverene	Ursus luscus
Racoon	Ursus lotor
Fisher, or pecan	Piscator
Red fox	Canis vulpes ruber
Gray fox	Canis vulpes cinereus
Black fox	Canis vulpes niger

Cross fox	Canis vulpes obliquus
Wolf	Canis lupus Americanus
Black wolf	Canis lupus niger
Dog	Canis indicus
Weasel	Viverra vulgaris
Ermine	Viverra Americanus
Martin	Viverra martes
Sable	Viverra zibellina
Skunk	Viverra putorius Americanus
Kinkajou	
Otter	Lutra, lytra Canadensis, aut lutra vulgaris
Mink	Minx Canadensis
Hedge hog, or porcupine Urchin, or urson	Erinaceus Americanus, aut hystrix dorsata
Black mole	Talpa Americanus
Meadow mole, of a dark mouse colour	Talpa pratensis

Order 4 —Glires.

Beaver	Castor, aut fiber Americanus
Musk rat	Mus zibethicus, aut mus Canadensis
Rabbit	Lepus cuniculus, aut lepus Americanus
Hare	Lepus timidus, aut lepus Americanus, aut lepus variabilis
Grey squirrel	Sciuris cinereus
Black squirrel	Sciuris niger
Red squirrel	Sciuris ruber
Striped squirrel	Sciuris striatus
Flying squirrel	Sciuris volans
Wood mouse	Mus sylvaticus
Wood rat	Mus
Jerboa	Dipus Canadensis
Woodchuck, or ground hog	Monax Americanus, aut monax arctomys

The woodchuck may be called the American marmotte. It is, however, a distinct genus from the marmotte of the Alps, described by the Count Buffon.

Order 1.—*Primates.*

Bat	Vespertilio murinus

Order 2.—*Bruta.*

Mastodon	Genus mastodon, aut elephas Americanus

The mastodon has no longer an existence in this State, or on the globe; its bones, however, have been found buried in the marshy lands along Wallkill river.

ANIMALS IMPORTED.

1st *Class*—Mammalia. 5th *Order*—Pecora.

Cow, or ox	Bos
Sheep	Ovis aries
Goat	Capra hircus

The common ox is the bison, reduced to a domestic state. It has run into as many varieties as the sheep. Bos Americanus et bos moschatus, are natives of America. The latter is called the musk ox. The bison, or wild ox, formerly lived in some parts of the western country. He is now found on the Mississippi, as far north as latitude forty-three or four. The American bison has not been reclaimed.

6th *Order*—Belluæ.

Horse	Equus caballus
Ass	Equus asinus
Hog	Porcus
Guinea pig	Cavia

The latter is a native of Brazil, in South America. It cannot endure the winter in open air.

3d *Order*—Feræ.

Dog	Canis familiaris
Cat	Felis catus

4th *Order*—Glires.

Rat	Mus decumanus
Mouse	Mus musculus

CLASS 2. BIRDS.

1st *Order*—Accipitres.

Great grey eagle	Falco regalis
Bald eagle	Falco leucocephalus
Sea eagle	Falco ossifragus
Osprey, or fish kawk	Falco haliætus
Great eagle hawk	Falco aquilinus, aut cauda ferruginio
Hen hawk	Falco gillinarius
Large pigeon hawk	Falco milvus, aut falco furcatus
Small pigeon hawk	Falco columbarius
Chicken hawk	Falco pularius, aut sparverius
Great horned owl	Strix pythaules. Corpore rufo
Whooting owl, or large grey owl	Strix acclamator
Screech owl	Strix asio. Corpore ferruginio
Cat owl, or horned owl small grey owl	Strix bubo Strix
White owl	Strix arcticus. Corpore toto nievo
Striped winged, or speckled owl	Strix perigrinator, corpore versicolore. Strix aluco
Barn owl	Strix passeri

The order accipitres, comprehends four generas, as the vulture, falcon, strix and lanius. The vulture and lanius are not natives of the State.

2d *Order*—Picæ.

Raven	Corvus corax
Crow	Corvus corone
Blue jay	Corvus glandarius, aut christatus
Black woodcock	Picus pileatus
High hole, or golden winged woodpecker	Picus auratus

Redheaded woodpecker	Picus erythrocephalus
Large speckled, or hairy woodpecker of Catesby	Picus villocus
Lesser speckled woodpecker	Picus minor
Small speckled, or small bluish grey woodpecker	Picus pubescens
Humming bird	Trochilus colubris
Kingfisher	Alcedo alcyon
King bird	Lanius tyrannus
Hang bird	Oriolus icterus
Golden robbin, or gold finch	Oriolus aureus

3d *Order*—Anseres.

Ducks	Anas
Golden eye	Anas clangula
Great wild duck Duck and mallard	Anas fera torquata, major, caput et collum veridi splendentis, dorsum griseo fuscum, pectore rufuscente, speculum violacrum.
Bull neck, or buffaloe head quindar	Anas bucephala
Black white faced duck	Anas leueocephala
Blue winged shoveller	Anas Americanus lato rostro
Summer duck	Anas sponsa
Blue winged teal	Anas discors
Least green winged teal	Anas migratoria
Whistling duck	Anas fistulosa
Light brown and white duck	Anas rustica
Little black and white duck	Anas minor picta
Various coloured duck	Anas principalis maculata
Black duck	Anas niger
Sea duck	Anas molissma
Grey duck	Anas cinereus
Old wife	Anas hyemalis, aut strepera
Canvass duck	Anas
Broad billed duck	Anas lata falx
Dipper	Anas albeola

Wood duck	Anas sylvaticus, aut arborea

Domestic Ducks—There are two kinds.

Common duck	Anas domesticus
Muscovy duck	Anas moschata

The latter is a native of Brazil and not of Muscovy.

Shell drake	Mergus
Cream coloured shell drake	Mergus merganser
Red bellied shell drake	Mergus serrator
Pied shell drake	Mergus castor
Great fishing duck	Mergus major putore rufo
Round crested duck	Mergus cucultatus
Eel crow	Colymbus migratorius

Teals—Anas.

Blue bill, or scaup duck	Anas marilla
Swan	Anas cygnus
Brent goose	Anas bernicla
Wild goose	Anas Canadensis
Tame goose	Anas anser
Loon	Colymbus immer
Water hen	Alca arctica
Great white gull	Larus alber
Great grey gull	Larcus griseus
Little white river gull	Larus alba minor
Mackarel gull	Larus ridibundus
Fishing gull	Sterna minuta

4th *Order*—Grallæ.

Crane	Ardea Canadensis
Stork	Ardea ciconia
Shite poke	Ardea
Heron	Ardea
Wood snipe	Scolopax fedoa
English snipe	
Grey snipe	
Yellow legged snipe	
Robin snipe	

Small sand snipe, or common snipe	Scolopax gallinago
Little pond snipe	Tringa griseus
Plover	Charadrius
Kilde, or chattering plover	Charadrius

5th *Order*—Gallinæ.

Wild turkey	Meleagris Americanus, aut gallo pavo sylvestris
Heath hen	Gallina erica
Meadow hen	Pratum gallina
Patridge, or pheasant	Tetras tympanus
Quail	Tetrao minor

DOMESTIC FOWLS.

Tame turkey	Gallus numidicus, aut Americanus

It is uncertain at this day whether our domestic turkeys are descended from the European stock, or those indigenous to America.

Hen	Gallina
Guinea hen	Gallina Indica
Peacock	Pavo vel pavus

6th *Order*—Passares.

Field lark, or large lark	Alauda magna
Sky lark	Alauda alpestris
Robbin	Turdus migratorius
Fox colored thrush	Turdus rufus
Wood thrush	Turdus melodes
Thrush, or mock bird	Turdus polyglottus
Black bird, or crow black bird	Turdus merula
Small brownish black bird	Turdus subniger
Small black bird with white on its wings, or skunk black bird	Turdus nigeralis superne albus
Red winged black bird, or marsh black bird	Turdus niger. Alissturnus nigeralis superne rubentibus

House swallow	Hirundo cauda aculeata
Barn swallow	Hirundo rustica
Ground swallow	Hirundo riparia
Black martin	Hirundo purpurea
House martin	Hirundo domus
Tame pigeon	Columba domestica
Wild pigeon	Columba migratoria
Turtle dove	Columba carolinensis
Snow bird	Emberiza hyemalis
Boblincoln	Emberiza oryzivora, aut carduelus Americanus
Yellow bird	Fringilla aurea
Small, or lesser yellow bird	Carduelus pinus
Least yellow bird	Carduelus pusilus
Blue bird	Motacilla cœrulia. Rubicula American cardulea
Wren	Motacilla regulus
Marsh wren	Motacilla palustris
Little bluish grey wren	Regulus griseus
Cat bird	Muscicapa vertice nigro
Spring bird	Fringilla salio
Night hawk	Caprimulgus Americanus
Whipporwell	Caprimulgus minor Americanus
Cross bill	Loxia curverostra
Hedge bird	Muscicapa Canadensis
Red bird	Avis ruber
Little sparrow	Passerculus
Chipping bird, or little house sparrow	Passer domesticus
Lesser chipping bird, or sparrow	Passer palustris
Small chipping bird, or sparrow	Passer agrestis
Phebe bird	
Winter sparrow	Fringilla grisea
Red, fox coloured, ground or hedge sparrow	Fringilla rufa
Large brown white throated sparrow	Fringilla fusca

3d *Class*—Amphibia.

1st *Order*—Reptilia.

River turtle	Testudo fluviatilis
Mud turtle	Testudo lutaria
Common frog	Rana temporania
Bull frog	Rana catesbeiana, aut rana boans
Tree frog	Rana arborea
Common toad, or land toad	Rana bufo
Tree toad	Rana zebra
Water toad	Rana fluviatilis
Black toad	Rana niger
Lizard, or yellow lizard	Lacerta punctata
Striped lizard	Lacerta striata
Water lizard	Lacerta aquatica
Swamp lizard	Lacerta
Swift	Lacerta fusciata

2d *Order*—Serpentes.

Rattle snake	Crotalus horridus, aut caudisona horrida
Pilot, or copper head	Caput gemmans
Land adder	Coluber terrestris
Water adder	Coluber fasciatus
Small brown adder	Coluber striatulus
House adder	Coluber punctatus
Black snake	Coluber constrictor
White necked black snake	Coluber
Striped snake	Anguis cryx
Green snake	Coluber saurita
Yellow bellied snake	
Milk snake	
Water snake	Natrix

4th *Class*—Fishes.

1st *Order*—Apodes.

Salt water eel	Muræna anguilla
Fresh water eel, or river eel	Muræna fluviatilis

Sea lamprey	Petromyzon marinus
Lesser lamprey	Petromyzon fluviatilis
Conger eel	Muræna congre
Sun fish	Tetrodon
Skate, or ray	Raia
Sword fish	Xiphias patypterus, aut xiphias gladius
Sword fish of Lake Ontario	Xiphias gladius Ontarionis

2d *Order*—Jugularis.

Genus Gadus.

Cod	Gadus Marhua
Haddock	Gadus æglefinus
Pollock	Gadus pollachius
Hake	Gadus merluccius
Whiting	Gadus merlangus
Whiting pout	Gadus barbacus
Bib	Gadus luscus
Poor	Gadus minuties
Small pollock	Gadus pollachius parvus
Tusk	Gadus brosme

Genus Cottus.

Bullhead	Cottus gobio
River bullhead	Cottus gobio fluviatilis
Bullfish	Cottus
Catfish	
Sheep's-head	Siluris
Catfish of Lake Erie	Silurus catus

Genus Pleuronectes.

Plaice	Pleuronectes platessa
Holibut	Pleuronectes hippoglossus
Flounder	Pleuronectes flesus

Genus Lophius.

Angler, or common fishing frog	Lophius piscatorius

3d *Order*—Thoracici.

Sole	Pleuronectes solea

Perch—Perca fluviatilis

Yellow perch	Perca aurea
Black perch	Perca niger
White perch	Perca candida
Sea perch	Perca marina

Bass—Centropomus

Sea bass	Centropomus marinus
Streaked bass	Centropomus striatus
Otsego bass	Centroponus Otsegensis
Black bass	Centropomus niger
White bass	Centropomus candidus

Mackerel—Scomber

Mackerel	S. scomber
Tunny	Scomber thynnus
Blue mackerel	Scomber cærulus
Horse mackerel	Scomber
Mullet	Mugil marinus
Mullet	Mugil fluviatilis
Red mullet	Mugil barbatus, aut mullus
Striped mullet	Mugil striatus
Common sucker	Cyclopterus fluviatilis
Black sucker	Cyclopterus niger
Pout	Ascellus barbatus

Red gurnard—Trigla ruber, aut cuculus

Grey gurnard	Trigla cinereus
Streaked gurnard	Trigla lineatta
Smelt	Osmerus eparlanus
Gar fish	Lepisosteus osseous

Genus Pomatomus.

Skibjack	Pomatomus skib

4th *Order*—Abdominalis.

Salmon—Salmo

Salmon	Salmo salar, aut salax

Lake salmon	Salmo eriox
Salmon trout	Salmo trutta
Trout	Truta, aut trutta
Red bellied trout	Trutta salvelinus. Salmo salvelinus
Speckled trout	Trutta maculata
Yellow trout	Trutta fario. Salmo fario
Char	Trutta alpinus
Pike	Esox lucius
Pickerell	Esox luciolus
Mascanunga	Esox erica
Herring	Clupea harengus
Pilchard	Clupea pilchardus
Shad	Clupea alosa
Sprat	Clupea sprattus
Anchovy	Clupea encrasicolus
Angel fish	Squatina
Carp	Cyprinus carpio
Roach	Cyprinus rutilus
Dace, or lake chubb	Cyprinus leuciscus
Common chubb	Cyprinus jeses
Sisco, or lake herring	Salmo harengus formis
White fish	Salmo clupea formis
Golden bream	Cyprinus aureus
Black, or blue bream	Cyprinus niger, aut caerulus
Red bellied bream	Cyprinus ruber
Silver, or white bream	Cyprinus candidus
Yellow bream	Cyprinus flavus

6th *Order*—Chondropterygii.

Genus Acipenser.

Common sturgeon	Acipenser sturio
Lake sturgeon	Acipenser hufo

Genus Squalus Shark.

Blue shark	Squalus glaucus
Barking shark	Squalus maximus
White shark	Squalus careharias

Porbeagle shark	Squalus cornubicus
Great dog fish	Squalus canicula
Lesser dog fish	Squalus catulus
Toad fish	Lophus piscatorius

Order 10th—*Amphibious.*

Genus Pocha.

Common seal	Pocha vitulina

Seals have occasionally been taken in lakes Champlain and Ontario.

Order Cete—*Genu* Ballæna.

Common whale	Balæna mysticetus

Genus Delphinus.

Porpus	Delphinus phocena
Grampus	Delphinus orcas

Genus Lopias

Toad fish	Lophius piscatorius

Those in the catalogue following are not arranged.

Shiner
Manhaden
Weakfish
Flatfish, or flounder
Bonetto
Kingfish
Silverfish

Grunts	Chromis
Sawfish	Pristes antiquorum

Red-drum
Black-drum
Branded-drum
Sheep'shead-drum
Killifish
Bergall

Tomcod
Spearings
Frostfish
Blowfish
Stengrey
Sardine
Lumpfish — Cyclopterus lumpus
Alewife
Flyingfish
Angler, or fishing frog, found on the south shore of Long Island
Blue fish — Begallo
Buffalo fish, found in Lake Erie
Porsie
Pond fish

In relation to the preceding arrangement and classification, I have consulted Nicholson's Encyclopædia, Philadelphia edition—Rees' Encyclopædia, and the Edinburgh Encyclopædia.

Quadrupeds.

We have estimated the number of quadrupeds, in the State of New-York, at forty species, without including several varieties, and those that have been imported. Several are similar to those of the eastern continent, while others are different. The moose, the bear, the wolf, the squirrel, &c. present varieties.

Moose—There are two varieties, the black and the grey.

The black moose is the largest quadruped found in our forests. Its height is from seven to nine feet; its length from the end of the nose to the insertion of the tail, is from seven to ten feet, and its girth from six to nine feet. Its head is large, its neck short, its eyes small, its ears long, broad and thick, its upper lip is square, and hangs over the lower, its tail is short, its horns are palmated, and its hoofs cloven. It inhabits the extensive forests lying between the Mohawk and St. Lawrence rivers, and lakes Champlain and Ontario. Its manners are extremely gentle and inoffensive; it will, however, defend itself with great courage and dexterity when driven to extremity,

both with his horns and hoofs. Its food is grass, shrubs, and the boughs and bark of trees.

The female usually brings forth two at a birth, in the month of April, which follow her about a year.

In the summer the moose go in families. In winter they congregate to the number of twenty or thirty. They choose the coldest places, and when the snow is deep, they form a kind of yard, consisting of several acres, in which they constantly trample, or beat down the snow that they may the more easily range around.

The moose, when roused by the hunter, runs with great rapidity—neither brush, logs or fences retarding his progress.—The hunting of this animal, is with some, a favorite amusement.

The large weigh from nine to twelve hundred pounds, but cases over nine hundred are extraordinary.

The moose is easily domesticated, and may be handled like an ox.

The grey moose inhabits the same forest. Its manners and habitudes are very much like those of the black moose. The only apparent difference seems to consist in size and colour.

The black moose of North America, Europe and Asia, is probably the same animal which anciently inhabited the forests of Germany and Poland. In the sixth book of the Gallic wars, Cesar speaks of an animal which he calls the Urus, which probably was the moose. The words of the text are: "*Tertium est genus corum, qui Uri appellentur. Ii sunt magnitudine paullo infra elephantos; specie et colore et figura tauri.*" *Magna vis est eorum et magna velocitas*—page 104.

Cesar did not see this animal, he speaks, as is evident from the words, from heresay; but, notwithstanding this, the size, colour, figure, strength and speed of the animal, which he describes, seem to come nearer that of the black moose, than perhaps any other.

The height of the moose is nearer that of the elephant, than that of any other known animal. The bulk, in some instances, is such as to give it a rank above every other animal of the temperate zone. According to Mr. Williams, some have been

killed in Vermont, that weighed thirteen hundred pounds, after being dressed, and it is probable, that more to the north they are much larger.

In the bogs and marl beds of recent origin, in Ireland, as well as in America, horns, in the fossil state, and even bones have been dug up, of an enormous size, which apparently belonged to an animal of the deer kind, but are far superior in dimensions, to those of any animal of the genus now known by naturalists. Their length has sometimes been of eight feet, and the distance from the tip of the one to that of the other, has extended to fourteen feet. From the fact, that no animal is now to be found on the globe with horns so enormously large, the inference is, that the species was extirpated by the same catastrophe which destroyed that of the mastodon.

The elk, at present, inhabits the forests of Alleghany, Cattaraugus and Chatauque. When full grown, it is nearly as tall as an ordinary cow, but it is not so long and heavy.—Its colour is red, in summer and autumn, but changes during the winter. Its horns are round, very large, and branching. These it casts annually in the early part of the season. The female has no horns.

The elk is very swift on foot, and often escapes the hunter. When hard pressed, it plunges into rivers and lakes, and either swims across, or keeps in the water till its pursuers abandon the chase. Its meat is highly relished by some.

The elk subsists on grass, leaves, and the twigs of trees.

The elk is found in various countries lying between Lake Ontario, and the city of Mexico.

Catesby calls it the Cervus Major Americanus, and Dr. Barton, the Cervus Wapite.

The numbers have been greatly reduced during the last twenty years.

The elk is susceptible of domestication, but it is necessary to keep him within a high enclosure, as he is fond of rambling about.

The rein deer, or carribou, it is probable, was once an inhabitant of this State. The skull and horns have been dug up on

the banks of the river Racket, near the forty-fifth degree, by Col. Hawkins. See Dr. *Mitchell's catalogue of organic remains.*

The deer originally inhabited all the counties in the State, but at present, it is chiefly confined to the northern and western forests. Its colour, in summer, is a light red, and in autumn, a cinerous brown. Its length, from the point of its nose, to the root of its tail, is about three feet and a-half, its legs are long and slender, its head small, its nose pointed, its eyes large, its horns are round, slender, and branching, and project forward, its tail is short. Its height is about three feet and a-half. It casts its horns every spring.

Deer herd together, from September to March or April, when they separate. The female generally brings forth her young in April—she usually has two, sometimes three. The male is called the buck, and the female, the doe—the latter has no horns. The deer feeds upon grass, leaves, twigs, and the tender branches of trees. It is easily tamed. It, however, is very mischievous, and will roam at large, unless confined within a very high enclosure. It is very timid, and never defends itself unless driven to the last extremity. When closely pursued by hunters and dogs, it betakes itself to some neighbouring lake or river, for safety. The meat of the deer is considered a great delicacy.

The hunters, in the new settlements, bordering the forests, kill great numbers every year. In half a century, very few, if any, will remain. None are now to be seen in the old settlements, some on Long Island excepted.

Half a century ago they were to be seen in herds within a mile or two of the Mohawk river; but now there are none.

In the winter the hunters in the new countries often avail themselves of crusts, when these animals break through, and are unable to fly, and destroy whole flocks. The destruction, on these occasions, is wanton, since neither their meat nor skins are worth much.

In 1762, these animals were so numerous in Queen's and Suffolk counties, that they were taken in pits. The legislature,

in December, the same year, passed a law to prevent taking them in this way.

The panther, in form, resembles the domestic cat. Its length from the nose to the root of the tail, is from five to six feet, and its height from two feet, to two feet four inches, and its circumference from two to two and a-half feet. The tail is from two feet and a-half to three feet long. It has a round head, shaped much like that of the cat—the eyes are large, the ears short and pointed. Its nose is broad, and the upper lip furnished with whiskers.

Its paws are armed with strong nails. The colour of the head, neck, back, sides, and tail, is a yellowish grey, bordering on red, and the belly and breast a light grey, inclining to white. The ground colour is red, interspersed with some grey hairs.

The panther is fierce, active, and strong, and when attacked by hunters and dogs, makes a desperate defence, fighting to the last. It subsists on deer, and other animals, which it seizes and kills. Like the lion, and others belonging to the feline tribe, it does not pursue its game, but conceals itself in the grass, or in some thicket, and darts upon it as it approaches or passes by. It sometimes ventures out of the forest and kills cattle, sheep and hogs. When pursued by hunters it commonly climbs a tree where it remains till shot.

The species is not numerous, and is mostly confined to the northern and western forests. There are some, however, still remaining in the Kaatskill, Broome and Tioga mountains.

The panther is a solitary beast, generally inhabiting the most gloomy recesses of the forest.

These animals retire as settlements are made; and as they are not very prolifice, it is likely, that half a century hence, none of them will remain in the State. Hitherto, every attempt to domesticate this animal has proved abortive.

The panther can endure long abstinence. In winter, he is often greatly emaciated, in consequence of not finding game.

This animal, with us, is improperly named. The panther of Asia and Africa is much larger, and more ferocious, and of a

different colour. In New England, the animal which we call the panther, is called the catamount, and in Siberia the ounce.

On the first settlement of the counties of Orange, Ulster and Dutchess, and for a long time thereafter, panthers were in such numbers, and committed such extensive ravages, that bounties were given to those who killed them. In 1753, the legislature of the colony of New-York, passed an act to revive and continue one which was then about expiring, and which had previously been passed for the destruction of wolves and panthers. The act seems to have been confined to those counties. Putnam and Rockland were then integral parts of Dutchess and Orange. The same act was renewed in 1759, and was to continue to 1765. At the same time, the act providing for the destruction of wild cats, in Suffolk, was continued for the like period.

The lynx is an inhabitant of the forest situated between the Mohawk and St. Lawrence rivers. Its size is usually that of a moderately large dog. Its hair is long, of a light grey colour, forming, in some places, small irregular dark shades—the end of its tail is black. Its fur is soft, fine and thick. The tail is about five inches long. It lives on deer, hares, rabbits, and other animals, which it takes by stratagem. Its howling greatly resembles that of the wolf. It ascends trees when pursued by hunters. The lynx is remarkable for its ears being long and erect, and tufted at the end with long black hair. It is extremely ferocious, and cannot be tamed.

This animal is the lupus cervarius of Linnæus. It is rarely seen. In former times it inhabited almost every part of the State. Like other animals of the feline tribe, it is solitary and unsocial. It easily overcomes the largest dog in single conflict.

The kincajou is about as large as a domestic cat; its tail equals its body in length. It dwells in the north part of the State. Its colour is yellowish. The kincajou is supposed to be of the feline tribe. It is very active and fierce. It climbs trees from which it darts on the smaller animals as they pass by.

The wild cat, the catus cervarius of Linnæus is considerably less than the lynx. Its length, from the point of its nose to the

insertion of its tail, is from two to two feet and a-half, and its height about fourteen or fifteen inches. The tail is three or four inches long. Its body is thick, its neck short, its head large, its muzzle square, its eys large, and its ears erect. Its paws are furnished with long nails. Its hair is brown, sallow and grey, variously intermixed, forming a brindle colour.

It lives in sequestered places, and takes its prey by stealth. It ascends trees and rocks.

There are only a few remaining in the State. They are rarely seen, except in the western and northern forests.

The wild cat, when overtaken by dogs, defends itself with great resolution to the last.

The black cat is less than the preceding. It is a distinct species. It weighs from sixteen to twenty-three pounds. It is active, strong and fierce in combat; its colour, as its name indicates, is black; it is untamable; the fur is valuable; it inhabits the northern forest. The Indians call it the wollaneeg.

Wild cats were so numerous in the county of Suffolk, that the assemby, in 1756, passed a law, fixing a price for every one that should be killed. The rate for the old was one dollar, and the catlings half a dollar per head.

Bear—There appears to be two species, both are black, but different in their forms and habits. The one has long legs, and the other short; we shall confine our description to the former.

The black bear, denominated by naturalists, the ursus Americanus, is a very large and formidable animal. Its height, when full grown, is nearly three feet four inches, and its length from the point of its nose to its posteriors, from five to five and a-half feet. The body is round, the neck and head long and tapering, the nose pointed, and its ears small and erect. The body of the bear rises somewhat in the form of an arch. Its feet are armed with sharp claws, and capable of grasping somewhat in the manner of a hand, which enable it to climb with great ease the loftiest trees—with its forepaws it can strike a heavy blow. It can rear itself on its hinder feet, and seizing its enemy, can squeeze him to death. It is carnivorous, but can subsist

on vegetables. It kills young cattle, swine, and other animals, which it eagerly devours. In new settlements, it enters wheat and corn fields, and devours considerable quantities. The female generally has two cubs at a litter, which keep with her during the season.

Towards the end of autumn, the bear retires into a hollow tree, den, or cavern, where it remains during the winter months (with some few exceptions) in an inactive state, requiring very little, or no food, without, however, experiencing the transition to torpidity. This state may be termed quiescent, since respiration goes on as at other times.

The bear is easily domesticated. In this State, when the cold weather commences, he will, on being set at liberty, collect materials, and form a bed in some sheltered place, and betake himself to it, and continue there till spring. During this time it usually makes its appearance once or twice, in order to drink some water. If chained, it takes nourishment and exercise like other animals. The quiescent state, however, seems to be most agreeable to its habits. The bear, when at liberty in the forest, occasionally, during thaws, which occur every winter, ventures out and sometimes makes excursions of several miles. Only a few years ago, two or three of these animals made their appearance in the vicinity of a small village, on the Sorel, in Lower Canada, during a thaw, as the public papers announced.

Wolverene, called in Canada the carcajou, and by hunters the beaver-eater, is supposed to be merely a variety of the glutton. Its length, exclusive of its tail, which is eight or nine inches, is about two feet, and the circumference of its body, about two feet six inches. Its legs are short and thick, and its feet and paws large and strong.

Its hair is long and coarse; its head is a sallow grey; its back almost black; its breast spotted with white; its sides and rump a light reddish brown; its belly a dark brown, and its tail black and bushy. It has a clumsey appearance, and cannot run fast. It burrows in holes which it forms in the earth.

The wolverene is carniverous. It is susceptible of domesti-

cation. The wolverene, at the close of autumn, retires to its den, where it continues quiescent till spring.

The raccoon, in its general form, has some resemblance to the fox, but it is much larger. The length of its body is about two feet and a-half; its tail is long and bushy; its legs short and thick, and its feet are armed severally with five sharp claws. The shape of its head is very much like that of the fox. The colour of the body is greyish, with annular stripes passing from the back to the belly; the tail is ringed.

In some the colour is yellow and brown, in alternate stripes. It is agile and sprightly; ascends and descends trees.

Its food consists of mast, corn, fowls, &c. It is easily domesticated, and becomes a familiar companion. It is, however, too mischievous to be allowed to run at large.

It lodges in hollow trees, and seldom ventures out, except at night. At the beginning of cold weather, in autumn, it betakes itself to the hollow of some tree, where it stays in a quiescent state, during the rigours of winter, never venturing out unless it be towards the close of a thaw. During its quiescence it continues in a state of abstinence.

The raccoon, when kept in a warm room during winter, receives food, is active, lively and playful, and shows no disposition for the quiescent state.

The fisher is from twenty to twenty-four inches in length, and about twelve in circumference. Its tail is little more than half its length, and is bushy. Its fore legs are from four to five inches long, and its hind from six to seven. Its ears are short and round. The colour of the body and tail is black; the head, neck and shoulders are grey. It lives on squirrels, mice, birds, and other small animals. It is found in the northern forest.

In Canada this animal is called pekan. The fisher occasionally pursues its prey into the water. They commonly live near streams, ponds, and lakes.

The Wolf—There are two varieties, the grey and the black. The latter inhabits the northern forest, but is seldom seen. The grey originally inhabited the whole State. At present it is rarely seen, except in the northern and western forests, and

some mountainous districts. The wolf is a very noxious animal. In form it very much resembles the dog. Its usual length, from the end of its nose to the root of its tail, is about three feet, its height is from two feet two inches to two feet four inches, and its girth about two feet eight inches. The wolf sometimes is much larger. The head is long, the nose pointed, the ears sharp and erect, the neck short and muscular, the body thick, the legs large and strong, the teeth long and sharp, and the eyes vivid. It is very ferocious and sanguinary. It kills deer, foxes, rabbits, sheep, calves, young cattle, hogs, and every other kind of animal, which it can master. Sometimes they go in packs, and attack flocks of sheep, and herds of cattle. But of all animals the sheep seems to be the object of their peculiar choice. These they attack and slaughter without pity or remorse, even after they have glutted their voracious appetite, seldom desisting before they have destroyed the whole flock. The wolf seldom shows itself during the day. It is very prolific, producing nine or ten at a time. The period of gestation is about three months and a-half. The young whelps are found from the first of May till July.

The common method practiced by hunters, to take this animal, is by trapping. It is sometimes taken in pits.

The dog (canus indicus) is about as large as a fox, but taller and of a slender make. Its nose is pointed, and its ears erect. It does not bark. We have seen several. They do not present such diversities as the imported.

Capt. John Smith, in his voyage, &c., says, "there are dogs in Virginia—that they are like wolves. They cannot bark, but they howl. In size they do not much exceed the fox. This was in 1606."

Fox—Of foxes, we have four species—the red, the grey, the cross, and the black fox. We shall treat of each in its order.

The red fox is the most common, and is found in every part of the State.

The length of a full grown one exceeds two feet, exclusive of the tail, which is about fourteen inches. Its height is about one foot, and weight twenty pounds. Its body is long, its tail

large and bushy, its head is small, its nose sharp, and its ears large, pointed, and erect. The colour is rather a yellow than a red.

The red fox is prolific. It subsists on squirrels, mice, birds, fowls, and such other animals as it can vanquish. In the cultivated country, it makes frequent incursions into barn-yards, and kills the poultry, which it carries away. These incursions are usually made at night, and are conducted with great foresight and sagacity. The skill of the fox, in the construction of its mansion, ranks it among the higher orders of quadrupeds. He burrows under firm earth, and often where, the roof of his dwelling is prevented from falling in by the wattling of the roots of trees. His subterraneous residence is generally extensive, and he provides to it several avenues for his convenience and security. In the selection of a place, he prefers the southern or eastern side of an eminence, or hill. The fox is not unfrequently observed, in fine weather, to quit his retreat and bask in the sun.

The fox is susceptible of a considerable degree of domestication, but is so mischievous, in poultry yards, that he cannot be permitted to run at large. When, however, he has been indulged with this privilege, he has seldom, or never failed, to regain his liberty.

The grey fox resembles the red, in form and magnitude, and appears to differ from it only in colour, which is a beautiful silver grey. Nature, however, has not endowed it with so much swiftness and cunning, as she has the red.

The cross fox resembles the latter, in form and magnitude, but has a black streak, passing transversely, from shoulder to shoulder, with another along the back, to the tail. The other parts of this animal are of a red, or more generally, of a grey colour.

The black fox, which is the largest and most valuable of all, is very rare, and never seen, except in the northern forest. Its fur is fine, soft, and rich, and in great estimation. In form, habits, and disposition, it has a strong likeness to the preceding.

The weasel is rather larger than the red squirrel. It is about

eight inches in length, from the end of the nose, to the insertion of the tail, and about two inches in height. The tail is about three inches long, and bushy. Its body is slim, its neck long, its head small, and its eyes sparkling. The colour of its body is red or brown, and its belly white. Its hair is fine, soft, and delicate to the touch. It is very active, sprightly, and courageous. It ascends trees, walls, and houses, with the same facility that the red squirrel does. The female bears from three to five at a time.

The weasel is a native of the woods. It subsists on birds, squirrels, mice, &c.—it sometimes makes its appearance in barns and houses, where it takes up its abode. On such occasions it wages an exterminating war against rats and mice, and even hens, ducks, and other small fowls. The night is the time it selects for its operations.

The ermine is the most beautiful quadruped in our forests. In form, dimension and habits, it has a strong resemblance to the weasel, but it is larger, being ten or eleven inches long. The colour of its head, neck and body is white; its tail is tipped with black. Some, however, have a stripe of brown or mouse colour, extending along the back, from the head to the tail. Its fur is very fine, soft and delicate. The ermine lives in woods and thickets, and lodges in hollow trees. It kills mice, squirrels, rabbits, birds, &c. and either sucks their blood or devours them.

The martin is a very beautiful animal. It dwells in the most sequestered parts of our forests, and is rarely seen in the improvements. It is carniverous, and subsists on rabbits, squirrels, mice, birds, and other small game. The martin is nocturnal, and seldom makes its appearance in the day. It ascends trees, and lives in the hollow part of the trunk, where it makes a nest with leaves, moss, &c. The female has commonly three or four young at a litter. The martin is capable of domestication, but always when indulged with freedom, returns to its native solitudes. The ordinary weight of the martin is about four pounds; some exceed five pounds, but instances of this kind are rare.

The usual length of the martin is eighteen or twenty inches, exclusive of the tail, which is eight or ten inches. Its body is long and slender; its head is small and elegantly formed; its eyes are lively; its ears are broad, round and open; its legs are short; its feet are broad, and its nails large and sharp. The colour of the body is yellow, with a brownish tinge along the back; the tail is brown, and in some instances black; the throat and breast are white. The colour of the martin varies in different countries. Those taken in Canada are darker than those taken among us.

The fur is fine, soft and downy, and is highly prized for muffs, tippets, &c. &c.

The sable is rather larger than the martin, to which it bears a strong similitude. Its form, gait, and habits are so nearly allied to the latter, that some have confounded them together. The colour is a brownish black, and the darker the more valuable. Its feet are broad and furnished with claws. It has large whiskers. The sable possesses much vivacity and great agility. It dwells along the banks of rivers and streams, and on the shores of lakes and ponds, selecting dark shady places. It climbs trees, and leaps from branch to branch. Its food consists of birds, mice, squirrels, rabbits, &c. It inhabits the northern forest, or that forest situated west of Lake Champlain, and between the Mohawk and St. Lawrence rivers.

The skunk is about as large as a cat, but differs very materially in shape, disposition and habits. Naturalists have classed it with animals belonging to the weasel tribe. Its body is slender, its legs are short and thick, and its tail is long and very bushy. The head, neck and shoulders are small and tapering, the nose sharp, the eyes sparkling, and the ears rounded and erect. Its hair is long, coarse, and chiefly black; but on its head, neck and back, there is more or less white, without regularity or uniformity. It resides mostly in the woods near clearings, but occasionally comes out and takes up its residence under barns, sheds and other buildings, where it is tolerably secure from danger, from whence it sallies out by night, and commits depredations among the poultry. These its kills and

carrys off to its retreat. In the woods it lives on birds, mice, frogs and insects. The female produces every year, and generally has five or six at a litter.

The skunk, when attacked, emits the most loathsome, subtle and penetrating fluid in nature. This fluid is contained in two vesicles situated near the anus, and is its only defence against the larger beasts of the forest. The panther, the lynx, the bear, the wolf and the fox seldom intermeddle with it. Few dogs will venture to attack it, on account of the extremely offensive smell, and such as do, are commonly seized with vomiting. A single discharge will infect the air on all sides, for the distance of a mile or more. If the clothes of a person should happen to be spattered with it, it would be impossible to extract it, without burying them in the ground for several days. The smallest drop infects a whole house, for weeks or months; so very subtle is the fluid.

The skunk seldom or never ejects this fluid, but when assailed by its enemies.

See *Medical Repository for an account of the dissection of one of these animals, by Dr. Mitchell.*

The otter is classed, by naturalists, among amphibious quadrupeds. Its length, when full grown, is from four to five feet, exclusive of the tail, which is ten or twelve inches more. Its body is long and slender, and shaped somewhat like that of the weasel; its head is rounded and slightly flattened in front; its ears are very short; its neck is short, and equals its head in thickness; its tail is broad at the insertion, very strong and pointed, and almost depressed; its hind feet are placed very near the tail. The eyes, which are small and lively, are placed nearer the nose than in other quadrupeds. Its legs are short, strong, broad and muscular; each foot is furnished with five toes, connected by webs, which aid it in swimming. The joints are so loosely articulated that it can turn them quite back, and bring them on a line with the body, and use them as fins. It swims so fast that it easily overtakes fish. Its colour is a dark brown, approaching a black. The otter differs in size and colour in different countries. In Canada it is larger, and of a

darker colour than it is with us; in Pennsylvania it is smaller and of a lighter colour. The fur is finer and richer in the north than in the south.

The otter is carniverous, voracious, strong, active and fierce. There are few dogs but what it can vanquish in single combat. Its food consists of fish, frogs, mice, and generally every animal which it can seize. It dwells along the banks of rivers, creeks and lakes, and burrows either in holes which it digs in the banks, or in hollows worn under them by the waters. It is very difficult to take it unless by trapping. The female is said to be in heat in the winter, and to bear her young in the spring. The litter generally consists of three or four.

Otters were formerly numerous along many of our rivers, creeks and lakes, but at present there are very few, and these are rarely seen. Their skins are in high demand, and always find a ready sale. The otter is occasionally seen along the Hudson and Mohawk rivers, and their tributaries.

The mink approaches animals of the amphibious kind. It always resides in the vicinity of a river, a stream, a lake or pond, where it provides for itself a habitation in the ground. Its length, including its tail, which is six or seven inches long, is about twenty-two or twenty-three inches. The body is slender, the legs short, thick, muscular and strong, and its feet are armed with claws. Its colour is a dark brown, inclining to black. Its fur is in considerable repute.

The mink weighs from three to four pounds. Its food consists of mice, rats, frogs, squirrels, birds, &c. The mink, when it resides near farm houses, kills goslins, chickens and young ducks, and sometimes hens. The female has usually two or three at a litter. Those residing on the sea coast are larger than those in the interior.

The hedge hog, or more correctly speaking, the urchin, a very extraordinary animal, is an inhabitant of this State. It is nearly as large as the red fox, and of a greyish colour. In its movements it is extremely slow. Its head, back and sides are covered with spines from one to three inches long, and the

nose, breast and belly with hair. The spines resemble, in some measure, the barrels of quills plucked from the wings of ducks, with this difference, that they are larger, and taper from the center, and terminate in sharp points. Each quill or spine is thickest near the middle, and inserted in the skin of the animal in the same manner that feathers are in a bird. The inside of the quills is spongy, like those of the goose. The quills are hard and of different colours, such as white, grey and black. They are very sharp at the extremities, and capable of inflicting severe wounds. They incline backwards like the bristles of a hog, and are partly covered with hair, except when the animal erects them.

These spines or quills are its only weapons of defence. When it is attacked by the panther, the lynx, the wolf, the dog, &c. it puts itself into a posture of defence, by rolling itself up like a ball and erecting its quills. The assailant soon finds some of the quills stuck into his mouth, or some other part, and every effort which he makes to free himself from them, causes them to penetrate the farther. Hence, he is obliged to retire. These quills are barbed, and after they are inserted, they penetrate farther and farther, often occasioning death. This death is, in general, a real starvation, attended with the most excruciating pain. We recollect to have once seen a dog, that had been engaged with one of these animals—his muzzle, jaws, mouth and tongue were filled with the quills; several had passed through and through his tongue. He was in great distress, two persons held him, while a third extracted the quills with a pair of pincers—some had penetrated three quarters of an inch. The dog went off and never was heard of afterwards.

The quills seem to have a penetrating, as well as an adhesive property.

The hedge hog, when unmolested, is a very inoffensive animal.

The female produces her young once a-year; the time of gestation is said to be about forty days, and she generally brings forth three or four at a birth.

The ordinary weight of the hedge hog is about eighteen

pounds. It subsists on the roots and bark of trees, and on berries and fruit. Its meat is highly prized by some.

The hedge hog, on the approach of cold weather, retires into the earth, or the hollow of some tree, and sinks into a torpid state, in which it remains till the following spring, when it is resuscitated by the vernal heat.

The Indians embroider their belts, moccasins, and some other things, with the quills.

The hedge hog is found in considerable numbers in the western counties, but in the eastern it is rarely seen.

Black Mole—This animal lives in and about the water. It differs from the European. It is seen in greatest numbers, in those parts of the State abounding in marshes.

The meadow mole is twice or thrice as large as the house mouse, and of a similar colour, only it is darker. Its eyes are very small and hardly visible. It lives in meadows and marshes, and burrows under old logs, tufts of grass, heaps of stones, and other rubbish, where it makes for itself a nest out of grass. In winter these animals form small covered ways in meadows, near and at the surface, in order to obtain food. Some of these extend rods, and have branches divergent on all sides. In making these, they eradicate the roots of grass, and destroy every thing; if perchance an apple tree, or other tree, of small size, should stand in the way, they are sure to bark it. The grass and stubble they raise in the form of an arch, which constitutes a warm and very convenient covering for them. They often commit great depredations in meadows, generally selecting those parts where there is considerable mould and vegatable earth; the roots and grass being larger, more abundant and nutritious.

The beaver is still found in some of our forests. It is somewhat shaped like a rat, except the tail, which is broad, flat, and covered with scales. Its length, from the end of its nose to the root of its tail, is from two feet four, to two feet eight inches, and its height from fourteen to sixteen inches. The tail, which is flat, is ten or twelve inches long, and five or six inches broad, tapering to a point, somewhat like a trowel, and about one inch

thick. Its legs are short and strong, and furnished with toes and webs. The toes are on the fore feet, and the webs on the hind. Its teeth are long, broad, strong and sharp. Four of these, two in the upper, and two in the lower jaw, are called incisors, and project from one to two inches. Its head is shaped like that of the rat, and inclined to the earth. Its body rises very much like an arch. The colour differs in different climates—with us it is brown—while in the northern parts of Canada, and around Hudson's bay, it is black. The fur is of two sorts, all over the body; the long and the short, or the coarse and the fine. The former is generally about an inch long, but on the back it is sometimes two inches, gradually shortening towards the head and tail, and is of little or no use. The latter is called the fur, and consists of a very fine and thick down, about three quarters of an inch long, and is that which is used in the manufacture of hats. Castor, which is in some use as a medicine, is found in the body of the beaver.

The beaver varies very much in size, weighing from forty to sixty pounds.

Among no class of animals does the social compact appear stronger than among beavers. In the months of June and July they collect together, and form themselves into a small commonwealth, that is to exist for nearly a year. Formerly these commonwealths contained from one to three hundred, but at present they are much less numerous, in consequence of the destruction made by hunters.

The place of meeting is commonly the place where they fix their abode, and this is always by the side of some river, stream, lake or pond. If it be a lake or pond, they dispense with building a dam; but if it be a river or stream, they then set about building a dam across it. The site which they select, on such occasions, is always one where they can form a pond, every way convenient for their purpose. And such is their understanding and foresight, that they never select a situation that will not answer their purpose.

Their dams are either direct, circular, or with angles, according to circumstances. The materials of which these dams

are constructed, are wood and earth. The situation being selected and fixed upon, they begin the dam. If there be a tree, which would naturally fall across the stream, several of the beavers set about cutting it down with their teeth. When this operation is performed, and the tree ready to fall, one gives the signal by striking with his tail upon the water. This is always observed when they fall trees. The centinal takes his post when the tree is nearly cut down, and as soon as it begins to fall, announces it.

Trees, twenty inches in diameter, are thus thrown across the stream. The next operation is to cut off all the limbs, that the trunk may assume a level position. Others, at the same time, are employed in cutting down smaller trees, and saplings, from one to ten or twelve inches in diameter. These, after felled, they cut into convenient lengths. Some drag the pieces of wood to the bank, and launch them into the stream, where they are taken by others and floated down to the place where the dam is to be built. As soon as a sufficiency of materials are on the spot, so that they can begin to build the dam, a large number engage in laying the pieces of timber, which may be called the raising of the dam. The lower ends of the pieces of timber are sunk in the earth, and buried, while the upper rest on the tree thrown across the stream. Such seems to be the construction of the dam, in its incipient state. While this part of the work is going on, others are engaged in carrying earth in their mouths, formed into a kind of mortar, with their feet and tails. This they spread over, and lay between the pieces of timber and stakes, filling up the interstices. Limbs, brush, twigs, grass and moss are also used with the mortar in closing up the holes and chinks. When this operation is done, they commence a second tier upon the top of the first, and so on until they have raised the dam to a sufficient height.

The dam, when completed, is from six to twelve feet wide at the bottom, and from two to three at the top. That side of the dam which is opposed to the stream, has a slope or declivity, while that side down, which the water descends, is per-

pendicular. The timbers and stakes, in the one case, are placed sloping, and in the other, perpendicular. The length of the dam varies according to the size of the stream, and other circumstances, but seldom exceeds one hundred feet.

The ponds which are formed by these dams, are of different dimensions, varying from five acres to five hundred. They generally cover lands which abound with trees and bushes of softish wood, such as willow, alder, poplar, birch, soft maple, &c.

The better to preserve their dams, the beavers always leave sluices or passages near the middle for the redundant waters. These sluices or passages are generally about eighteen inches in width and depth, and as many in number as the waters of the stream require.

When the dam is finished, the beavers separate into small bodies to build their houses. These are built upon piles along the borders of the pond, and are of an oval form, resembling cocks of hay. They vary in their dimensions from four to ten or twelve feet in diameter, exclusive of the walls, according to the number of families which they are designed to accommodate. They never have less than two stories, generally three, sometimes four. The walls are two or three feet thick at the bottom. They rise perpendicularly about three feet, and then assume a curved form, and terminate in a dome or vault, which answers the purpose of a roof. These edifices are constructed with the same materials as their dams, and have much solidity and neatness. They are smooth within but rough without. They preclude both rain and cold. The lower story is about two feet high; the second story has a floor of sticks covered with mud; the third story is divided from the second in the same manner, and terminated by the roof. Through each floor there is a door of communication, and the upper story is always above the level of the water. Each edifice has two doors; the one on the land side, to enable them to go out for provisions, and other purposes; the other, under the water, and below where it freezes, to preserve their communication with the pond. If the pond at

any time begins to be covered with ice, it is immediately broken, that the communication with the air may not be cut off.

The smallest of their edifices contains one family, consisting generally of five or six beavers, and the largest from twenty to thirty.

The male and female always pair. In September they lay up their store of winter provisions. This consists of bark and the tender twigs of trees, and various kinds of soft wood. When this is done the season of repose commences. They remain in their houses during the winter, enjoying the fruits of their labours. Towards the end of the winter, the females bring forth their young, to the number of three or four. Soon after the male retires to gather fish and vegetables, as the spring opens; but the female remains at home to nurse and bring up her young. The male occasionally returns, but not to tarry until the fall. But if any injury be done to their dam, the whole society soon collect and repair it.

The utmost harmony pervades these commonwealths. Every family knows its own room and stores. Different commonwealths of beavers never make war upon one another, or upon other animals. When they are attacked by their enemies, they instantly plunge into the water to escape; and when they cannot escape, they fall an easy prey. When an enemy approaches their little domain, the beaver which makes the discovery, by striking on the water with his tail, gives notice to the whole society of the danger, and all of them immediately plunge into the water.

The beaver is eagerly sought after by hunters, on account of the richness of its fur, and the high demand it is in. They take them in traps and otherwise. In the winter, when their ponds are covered with ice, the hunters go to their houses and drive them into the water, and then post themselves at the holes which the beavers have made in the ice, and wait till they come to those places to breath and obtain fresh air, when they knock them in the head with hatchets. Sometimes they succeed in killing every member of the society.

At the commencement of the colonization, and for a century after, these animals were numerous, and found in almost every part of the State, but at present there are very few, and these live mostly in the forest between the Mohawk and the St. Lawrence rivers.

For part of the foregoing description of the beaver, we refer the reader to *Williams' History of Vermont.*

Muskrat—This animal is about fifteen inches in length, from the end of its nose to the root of its tail, and its body about one foot in circumference. The tail is about ten inches long; its body is short and thick; its neck and head small; its nose pointed; its legs short and strong, and its feet armed with claws.

The colour of its body is grey, with some reddish hair. The whole conformation of this animal, if we except its tail, which is flat, bears a strong resemblance to that of a house rat. In its nature, however, it approaches nearer the beaver than almost any other animal. Like the beaver, when undisturbed, they live in societies, on the borders of lakes, ponds, rivers and streams. They generally select marshy grounds.

They construct their habitations with sticks, grass and mud. These habitations are from four to five feet in height, and about as large as a common cock of hay, and somewhat in the same shape. The avenues leading into them, are usually covered. The one leads to the water, and the other in an opposite direction. The former is intended to afford a retreat to the water, in case of an attack by an enemy, and the latter for all other purposes. Several families reside in the same habitation.

They do not lay up their winter stock like the beaver. Their food consists of roots, grass and plants.

The female has from four to six at a litter.

In spring they disperse in pairs, and do not re-assemble before autumn.

The muskrat has a strong fetid smell, faintly resembling musk. This animal is quite inoffensive. Its fur is in considerable demand among hatters.

At present there are very few muskrats in the cultivated

country, and these seldom construct habitations, probably from an apprehension that it would lead to a discovery of their abode.

Considerable numbers still remain in the northern forest. These usually reside on the margins of the ponds and lakes so plentifully distributed over that region, and along the banks of rivers and streams.

The rabbit is found in our forests, and in the woods in the cultivated parts. In form and habit it resembles the hare, but it is rather smaller. It subsists on vegetables, grass and clover. Its ordinary colour, in summer, is a lightish grey, and in winter, a dirty white, or black. It makes a hole in the ground, on the declivity of some hill or rise, which serves it for a habitation, and a retreat in case of danger. It is very swift on foot, and is seldom taken unless by surprise. The rabbit is a very harmless and timorous creature, and flees upon the slightest alarm.

The female produces six or seven times in a-year, and has from four to eight at a litter. The period of gestation is about thirty days.

The rabbit is easily domesticated. It is a very lively, sprightly and playful animal. In a domestic state they are larger than in a state of nature. Their colours are also more various.

Like the hare, it has four cutting teeth, two above and two below, and five toes on each foot.

The hare is about fifteen inches in length when full grown, and weighs seven or eight pounds. It has four cutting teeth, two in the upper jaw and two in the lower, and five toes on each foot. Its body is short and thick; its legs are long, and its ears large and pointed. It has large prominent eyes, placed backwards in its head, so that it can almost see behind as it runs. The hinder legs are considerably longer than the fore. Its colour is white.

The hare subsists on grass, plants, and the twigs and bark of young trees. It is very prolific. The period of gestation is about thirty days. The female bears three or four at a time, and has several litters in the course of a year.

The hare is very timid, and altogether inoffensive. It is one of the swiftest animals in the world, but it cannot hold out like the wolf, the fox, and the dog. It feeds by night.

The hare is chiefly an inhabitant of the northern forest.

Squirrels—Of this animal there are four species and two varieties:—we shall commence with the grey. It would be more correct to say, three species, because the flying squirrel belongs to a separate genus.

The grey squirrel is the largest, and is found in almost every part of the State. It is about eleven or twelve inches in length, exclusive of the tail, which is as long as the whole body. It builds its nest in the hollow or crotch of a tree, with leaves, sticks and moss. The female bears her young in the spring, and has generally three or four at a time.

The grey squirrel subsists on mast and corn. In autumn it lays up provisions for winter in the hollow of some tree. On the approach of cold weather, it secludes itself, and seldom makes its appearance before spring.

The grey squirrel is a beautiful animal. It is active, playful and industrious. It is easily domesticated.

It rarely ventures into the fields unless there be trees. It ascends the tallest trees, and where the tops interlock, it passes from tree to tree with great rapidity.

The black squirrel resembles the grey in all respects but size and colour, being somewhat smaller. It is merely a variety of the same species, distinguishable from those two circumstances. Like the grey, it, in the fall, lays up provisions for the ensuing winter, and on the approach of cold weather, withdraws, seldom showing itself before spring.

Both the black and the grey squirrel migrate in some seasons from one tract of country to another. These migrations are in general occasioned by a defect in mast. Many die with famine in seasons of scarcity. They are more numerous after two or three years of plenty, than after a year of scarcity.

The red squirrel is not over seven inches in length, from the end of its nose to root of its tail. It has a red list along its back; grey on its sides, and white under its belly and neck.

It differs in some respects from the common red squirrel of Europe. It lives on mast, corn and seeds. It is extremely active, and very nimble. It ascends and descends trees with great facility. It is noisy, bold and impudent.

The red squirrel is found in all parts of the State, and often in great numbers. They commit great ravages in wheat and corn fields, and especially in those adjoining woods and coppices.

Their numbers seem to have increased with the improvements. In those seasons when mast is not plenty, great numbers die during winter with famine.

The striped squirrel is still less than the red. Its colour is a deep yellow, bordering on red. It has a stripe of black along is back; at the distance of about half an inch on each side is a stripe of white, bordered with very narrow stripes of black. Its belly is white. In the male, the colours are brighter, and better defined than in the female. It subsists on mast, corn, wheat, &c. and is very destructive to fields of grain adjoining woods. It burrows in the ground, and has a predeliction for woods timbered mostly with beach and chesnut. It never ascends trees unless it be for safety, and then it comes down on the first opportunity.

The striped squirrel lays up mast, wheat and corn for its winter store. These it carries in its mouth, which it can distend sufficiently for the reception of half a gill. It is never seen in the winter. These animals are found in great numbers in almost every part of the State.

The flying squirrel is something less than the striped. Its skin is very soft, and elegantly adorned with fine hair. The colour of its back and sides is a dark grey, and its belly and breast white. Its eyes are large, black, prominent and lively; its ears are small, and its teeth long and very sharp. It is distinguished from all other animals, by the peculiar conformation of its wings and legs.

The wings to which its legs are attached, are composed of two skins, or webs, of a very singular formation, extending from the fore feet to the hinder. These webs, whenever the animal stretches its fore legs forward, and its hinder backwards, are

spread out between them, somewhat like those of a bat, and aid it in passing from one tree to another, without coming to the ground. Its tail, likewise, which is flat, serves to direct and assist it. When it wishes to pass from one tree to another, it mounts to a sufficient height, and then descends in a right line, falling at an angle with the horizon, of about forty-five degrees. The distance, sometimes, exceeds forty feet, while at others it falls short.

The wings, when the animal reposes, walks or runs, are contracted on its sides. It mounts trees with great nimbleness. It feeds on buds, bark, seeds, &c. It is a solitary creature, and generally resides in the hollow of some decayed tree. It is readily domesticated. It is inoffensive.

The water rat is about the size of the common house or barn rat. It is brown on its back and sides, and white under the belly. It subsists on aquatic animals.

The wood rat is not half as large as the house rat, and dwells in woods, swamps and marshes. In form, it has a striking resemblance to the house rat. Its colour is a darkish brown, bordering on black. It is more agile and swift than the house rat. It is said that they construct for themselves habitations two or there feet high.

The wood mouse resides in the woods, as its name imports, in swampy and moist places, abounding with brush wood. It is larger than the house mouse, and of a darker colour. It is swifter on foot, and more active and hardy than the house mouse.

The shrew mouse is the smallest quadruped found in the State. Its length does not exceed two inches and a-half. The head looks something like that of the mole; the ears are wanting; the eyes are very small; the nose long, pointed, and furnished with long hairs. The colour is very much like that of the house mouse—they live in the woods.

The jerboa is rarely seen. It is about as large as the house mouse, but has longer legs. It is very nimble when pursued, and makes leaps of two or three feet. It is not seen between October and April.

The woodchuck is found in all parts of the State. It is a slow, clumsy animal. Its length, from the nose to the insertion of the tail, is about fifteen inches. The tail is small and moderately long, and covered with long coarse black hair. Its head is small and flatish; its nose pointed; its ears short, rounded and erect; its neck and body thick, and its legs short. The upper and lower cutting teeth are bevelled; the grinders are eighteen in number, ten in the lower, and eight in the upper, jaw. Its cheeks have no pouches. Its body is brown, with some grey hairs. It burrows in the ground. Its food consists of pulse, vegetables, clover, &c. It is generally fat, except in the spring. Its meat is eaten by some. The female has five or six at a litter.

The woodchuck, on the approach of cold weather, retires to its burrow, where it becomes torpid, and remains in that condition till roused by the warmth of spring. In the selection of a place for its burrow, it generally chooses loamy lands, and the south or southeast side of a hill, or rise of ground.

The woodchuck, in some respects, resembles the marmotte of the Alps. Like that animal, it burrows in the earth, and in cold weather passes to the torpid state. Like that animal, it subsists on pulse, grass, and vegetables. Some naturalists, and among others, the celebrated Buffon, have called it the monax, or marmotte. It is probably a distinct genus from the marmotte of the Alps. The woodchuck inhabits all the northern and middle Fredish States. The numbers diminish as the country is cleared. It is rarely seen in those parts which have been cultivated for a century, and which are well peopled. It is susceptible of domestication, and when kept in a warm room during cold weather, receives food, and continues lively all the year. The room, however, must be kept constantly warm, otherwise it sinks to the torpid state.

The Bat—This animal seems to form the link between quadrupeds and birds. It is about two inches and a-half long, and about eight broad, when the wings are spread out. Its colour is very nearly like that of the house mouse. It lives on flies and insects, which it takes while on the wing. The bat is noc-

turnal, and usually makes its appearance in the early part of the evening, entering houses and barns. It flies with considerable rapidity, appearing somewhat like a house swallow.

Bats, in summer, congregate to the number of several hundred, in the hollows of trees, and between the bark and bodies of such as are dead. Of the latter, we have seen an instance, in which upwards of one hundred were between the loose bark and body of an old tree.

Bats are hybernating animals. On the approach of cold weather, they retire to dens and caverns, where they pass into the torpid state, and continue till the following spring, when they are roused and resuscitated by the vernal heat.

There is but one species, and that is called the house bat. It is an inhabitant of every part of the State.

Mastodon.—This animal, which was once an inhabitant of this State, it is supposed, has no longer an existence on our globe. The bones have been found in a fossil condition in Orange and Ulster counties in this State, and in several of the other Fredish States. The race seems to have inhabited a large portion of North America, at some unknown and very distant period.

The bones of the same animal, or one bearing a strong resemblance to it, have been found in several places in Europe and Asia, particularly in Siberia, and usually in situations similar to those places where they have been found in America. From these facts it appears to have been indigenous to the northern parts of both continents, and to have been capable of enduring cold.

Dr. Mitchell, and some other naturalists, have enumerated four distinct species, which seem to have differed chiefly in size. These were all species of the genus mastodon. Some equalling, some surpassing, and others falling short of the magnitude of the elephant of India and Africa. The mastodon of New-York appears to have equalled the elephant in dimensions.

The celebrated naturalist, M. Cuvier, calls it the genus mastodon, that is the American elephant.

The extinction of the race, it is probable, was occasioned by

a deluge, which must have covered the greater part of the globe. This deduction has been made, upon a very careful examination of the bones, and all the facts presented by the different localities where the bones were found, and otherwise. We cannot do better than give the words of M. Cuvier on this higly interesting subject.

"These bones are buried almost every where, in nearly similar beds; they are often blended with some other animal remains, resembling those of the present day The beds are generally loose, and either sandy or marly, and always neighbouring more or less to the surface. It is then probable that these bones have been enveloped by the last, or by one of the last catastrophies of this globe. That is, by an inundation, which did not rise above the mountains. In a great number of places they are accompanied by the accumulated remains of marine animals; but in some places, which are less numerous, there are none of these remains; sometimes the sand or marl which covers them, contains only fresh water shells. No well authenticated account proves that they have been covered by regular beds of stone, filled with shells; and consequently, that the sea has remained on them, undisturbed for a long period.—The catastrophe which covered them was, therefore, a great but transient inundation of the sea. This inundation did not rise above the high mountains, for we find no analagous deposites covering the bones, nor are the bones themselves met with there, not even in the high vallies, unless in some of the warmer parts of America. These bones are neither rolled nor joined in a skeleton, but scattered, and in part fractured. They have not then been brought from afar by an inundation, but found by it in places where it has covered them, as might be expected, if the animals to which they belonged had dwelt in these places, and had there successively died. Before this catastrophe, these animals lived, therefore, in the climates in which we now dig up their bones; and as we no longer find them, it is evident that it has annihilated those species.

"The northern parts of the globe, therefore, nourished formerly, species belonging to the genus elephant, hippopotamus,

rhinoceros and tapir, as well as the mastodon genera, of which the four first have no longer any species existing, except in the torrid zone; and of the last, none in any part of the world.

"M. Cuvier, from the examination of the bones of these animals, and all the circumstances attending them, conceives we have a right to conclude, that the mastodon of North America did not surpass the elephant in height, but was a little longer in proportion; its limbs rather thicker, and its belly smaller. That it seems to have very much resembled the elephant in its tusks, and indeed in the whole of its osteology; and that it also appears to have had a trunk. But that, notwithstanding its resemblance to the elephant, in so many particulars, the form and structure of the grinders are sufficiently different from those of the elephant to demand its being placed in a distinct genus. He supposes its food must have been similar to that of the hippopotamus and the boar, and that consequently it inhabited low, soft and marshy places."

The bones, found in the drowned lands, in the county of Orange, were enveloped in marl, eight or ten feet below the surface. They were in a remarkably high state of preservation. It is said that the bones of no less than nine of these animals have been dug up, in opening ditches in the swampy and marshy lands along Wallkill river, in Ulster and Orange counties. All these bones were in, what might be called, a fossil state; that is, they were hardened, and charged with earthy matters to such an extent as to increase their weight, change their nature, and give them the appearance of stony substances.

The following are the dimensions of one of the skeletons, now in Mr. Peale's museum, Philadelphia:—height eleven feet; length seventeen feet six inches; width at the hips five feet eight inches; width of the head three feet two inches; the length of the longest rib four feet seven inches; the diameter of the thigh bones and tusks six inches. The skeleton is entire, with the exception of two ribs. These remains were dug up on the farm of a Mr. Mastin, in 1801.

The mastodon is a new genus of quadrupeds, and hitherto

unknown in any except the fossil state. It seems to have had a general resemblance to the elephant; hence, many have confounded it with that animal. The bones have been found in the State of Kentucky, at a place called Big-Bone Lick, in considerable numbers, and about six or seven feet below the surface, in a layer of red marl. Before the settlement of the country, deers, elks and buffaloes frequented this saline in large numbers, being attracted by the salt. At present, domestic animals, of the herbiferous kind, repair thither. This has led some to suppose that these are the bones of such as died in the vicinity. This supposition does not appear to be well founded—first, because the bones would have lain on the surface, where they would have entirely disappeared from constant exposure to heat and cold, moisture and dryness—second, because they have not elsewhere been found in numbers about salt licks. Bones do not become fossil that lie on the surface of the earth; but decay, and absolutely disappear. They do not imbed themselves by lying on the surface, where they may sometimes be covered with leaves and alluvial matter. But those who have been pleased with an Indian story, related in the bombastic stile, have not informed us that these were covered in this way by alluvions. We have never heard of elephant's bones being found in a fossil state on the surface, although we have beneath the surface, and in situations not unlike those where those of the mastodon have been found. The conjecture of Cuvier seems to be well founded. It derives additional weight, from the consideration, that the bones of other animals, whose races are extinct, have been found in the same countries, in the fossil state. Two species of fossil bears have been discovered, both of them distinct from the existing ones. They are distinguished by the title spelæus and arctoideus. The first is about the size of a horse, and the second is considerable less. They occur in limestone caves, in Germany and Hungary. In some of the same caves there have been found remains of many different animals, such as hyenas, lions or tigers, dogs or wolves, foxes, pole-cats and rhinoceroses. All these

bones are intermixed with earth, containing much animal matter. They are in general incrusted, but not mineralized.

The fossil remains of some species of the genus equus, and also of the genus bos, have been found in Europe, Siberia, &c. in the same situations where those of the elephant, mastodon, &c. have been discovered. They differ from the now known species. We might enumerate several other species and genuses of distinct animals, but it would be a departure. No doubt seems ever to have been entertained of the extinction of most of the above races of animals, except that of the mastodon, and the best evidence we have of its existence, at this day, is an Indian story, well told, by a man who wanted to induce a belief, that nature was more bountiful in great productions, on the west, than on the east side of the Atlantic ocean. But taking his relation, and those of his credulous transcribers, who have clouded this subject with so much fiction—is it probable that none of the fur traders, and their servants, and the travellers, who have crossed the continent of America, in several places, should not have heard, and even seen those animals, did the race still exist? Is it not probable that some of the numerous tribes, living in the interior, should not have seen or heard of them, did the race but exist? We say it is not possible, much less probable. A small animal might not excite curiosity, but one exceeding all others in size would, did such a one exist. Some of the Philadelphia compilers have expressed considerable dissatisfaction because the European *literati* have refused to credit this marvellous story which falsifies itself; but these gentlemen ought to have examined the case before they lavished censure.

BIRDS.

The bald eagle measures from two feet six to two feet ten inches in length, and from seven to eight feet in breadth, and weighs from twelve to fifteen pounds. Its bill is short, thick and hooked, and is nearly three inches long. Its legs are short and thick, and its feet armed with four large sharp claws. The

colour of its head, neck and back, and the covert feathers of its tail is brown, and its breast and belly grey, intermixed with some white. Its sight and sense of smelling are extremely acute. It is a solitary bird, and is rarely seen, except among the mountains. It kills hares, rabbits, squirrels, lambs, fowls, serpents, &c. and devours them.

They go in pairs, and usually have two young at a time.

The eagle builds its nest on some inaccessible cliff, craggy steep, or on the top of some very small tree. The nest is constructed of limbs, brush, moss, &c. and exceeds three feet in diameter.

The bald eagle soars very high, and can remain a long time on the wing. It descends upon its prey with inconceivable velocity.

This eagle is adopted as the emblem of the United States. They occasionally show themselves on the Atlantic coast, and around the lakes. They continue here all the year.

The female is said to be larger than the male.

The sea eagle, or osprey, as it is sometimes called, is found on the coast of the Atlantic ocean, and on the coasts of the lakes. Its head, neck, back and wings are of a whitish colour, mottled with spots of an iron brown; its breast and belly are white, with iron coloured spots. The covert feathers of the tail are of a whitish colour, with black at the ends. Its bill is short, crooked and thick; its feet are armed with four large claws, and its legs are short, thick and muscular. A sort of beard, or tuft of feathers, depends from the base of the under mandible. It is nearly of the size of the bald eagle. It subsists principally upon fish, which it catches by plunging into the water. The sea eagle builds its nest on some tree, or on the cliff of some rock, neighbouring upon the ocean or some lake. It occasionally visits some of our lakes, where it takes up a temporary residence. The length of the male is about two feet six inches. The extent of the wings, when spread out, is about seven feet four inches.

The osprey, or fish hawk, frequents the shore of the Atlantic ocean, the shores of the lakes, and the Falls of Niagara.

Fish constitute its principal subsistance. It is the most numerous of the larger birds of prey. It darts upon its prey with quickness and precision. The fish hawk builds its nest on a tree. It is frequently seen about some of our inland lakes, particularly such as abound with fish.

The fishing hawk is brown above and white beneath, with a whitish head, and blue cere and legs. The minuter markings vary considerably, according to age. The male is about twenty-two inches long—the female rather exceeds two feet, and measures five feet seven inches from the tip of one wing to the other wing. Its legs are short and strong; the outer toe turns easily backwards, and the claw belonging to it is larger than that of the inner one.

Great eagle hawk, or hen hawk, is nearly two feet in length, and about four feet six inches in breadth, when the wings are extended. Its head is large, its bill thick, short and crooked, its legs are bare, short and thick, and its feet furnished with long, strong and sharp claws. The head, neck, back and wings are brown; the covert feathers of the tail an iron brown, and the breast and belly grey, with some white. It inhabits the southern parts of the State. In Pennsylvania and Ohio it is quite common. It is not migratory. It lives on small birds, chickens, squirrels, mice, snakes, &c.

The hen hawk inhabits every part of the State. It is not a bird of passage. It is about twenty inches long, and nearly four feet broad, measuring from the tip of one wing to the other. Its bill is crooked and thick, its head large, its neck short, its legs thick and short, and without feathers, its feet are furnished with large, sharp claws. The colour of the head, neck, back and wings is brownish, mottled with grey; the covert feathers of the tail are brown, with some grey and white at the extremities; the belly and breast are grey, with whitish spots, appearing speckled. Its lives on mice, squirrels, birds, chickens, &c. They go in pairs, and build their nest either in the hollow or top of some tree. They construct it with small limbs, twigs, leaves and grass, exhibiting little ingenuity or taste.

The kite, or large pigeon hawk, is distinguished from the hen hawk by its size, its forked tail, and its wings. The colour of its head, back and wings, and the upper feathers of its tail, is a ferruginous brown; the feathers of the breast and belly are brown and grey, so intermixed as to appear mottled. Its head is large, its bill thick and hooked, its legs bare, short and muscular, its feet are armed with sharp claws, its wings are more pointed than those of the hen hawk, bearing a resemblance to those of the pigeon. On the wing it moves with great rapidity. It descends from the greatest height, upon its prey, instantaneously, and with almost unerring aim. In length it is about eighteen inches, and in breadth about two feet and a-half. Its tail is long and forked. Like the preceding, it subsists on small birds, mice, &c. We are uninformed whether it is migratory or not. We have seen it in winter, although very rarely.

The small pigeon hawk resembles very much the hen hawk, in conformation, only it is less, and of a lighter colour. It is about thirteen or fourteen inches in length, and about two feet in width when the wings are stretched out. It remains here the whole year. Its subsistence consists of small birds, mice, &c. It flies very fast, and often overtakes the pigeon. Its wings are more rounded at the extremity than any other bird belonging to the hawk tribe.

The chicken hawk is less than the pigeon hawk, not surpassing the turtle dove in dimensions. Its shape is very much like that of the large pigeon hawk, only its tail is square and shorter. The colour of its head, neck, back, wings and tail, is a light brown, with some grey; its breast and belly are spotted with grey, white and brown. It builds its nest in the hollow of a tree. The female has four or five young at an incubation.

They go in pairs. The chicken hawk is migratory. It departs in the early part of autumn, and returns in April or May. It is very swift on the wing. Its food consists of small birds, mice, snakes, &c. By some it is called the American merlin. It exhibits some diversity in the shades of its colour.

The owl, in natural history, a genus of birds of the order

accipitres. Generic character; the bill is hooked, but not furnished with a cere; the nostrils are oblong and covered with bristly feathers; the head, eyes and ears are large; the tongue is bifed; the claws hooked and sharp. Birds of this genus are rapacious. They are seldom seen by day. At night they are active in quest of food.

The white owl cannot strictly be said to be an inhabitant of the State. It, however, occasionally comes among us, and takes up a temporary residence. It goes as far south as Pennsylvania and Virginia. The whole plumage is of a snowy whiteness; sometimes pure, but more frequently marked with dusky spots. Its head is less, in proportion, than that of other owls. The bill is black and the irides yellow. It measures about two feet in length. The distance from the point of one wing to that of the other, is from four feet eight inches to five feet. Its weight is from two to three pounds. It is capable of sustaining all the rigours of an arctic winter. Its food is birds, rabbits, and other small animals.

The great owl, great eared, or great horned owl, is about two feet and a-half in length, from the point of the beak to the extremity of the tail. The whole plumage is a mixture of brown fulvous and subrufous, disposed in spots and bands; the brown of the upper parts and wings, is darker than that of the belly and abdomen, and the breast is whitish. But this general description admits of considerable diversity. It can bear both heat and cold. It is common between the St. Lawrence river and Hudson's bay. They are seldom seen in this State. It haunts mountainous, rocky and desolate situations, remote from the habitation of man. It subsists on fowls, mice, and other small animals. Its arrival in the night is announced by its doleful cry. The great owl may be domesticated. Formerly they were employed in falcony. It inhabits most of the continent of North America. It is also found in Europe, Asia and Africa. The lugubrious clamour, and solemn aspect of this bird, contribute to associate it with ideas of gloom and repulsion.

The whooting, or large grey owl, is about twenty-two inches in length, and about four feet in breadth, from the extremity of one wing to that of the other. Its bill is thick, short and hooked; its head and eyes are large. The latter are chatoyant, like those of the cat. Its legs are short, and armed with large sharp claws. Both the legs and feet are covered with feathers. The colour of the head, neck, back, wings, and upper feathers of its tail, is grey, interspersed with brown and some white; the neck, belly, legs and feet are mottled with grey and white. It is solitary, and inhabits dark and gloomy places, covered with evergreen trees. It is nocturnal, seldom showing itself in the day. They go in pairs, and subsist on small animals.

Its notes are hedious, and rarely uttered, except by night. On such occasions, when several happen to meet, they utter doleful sounds, which fill the minds of those unaccustomed to them with horror.

The body is much smaller than that of the hen hawk. It remains here all the year.

The screech owl is nearly as large as the small pigeon hawk. Its colour is a rusty brown. It dwells in sequestered places, clothed with evergreen trees. It remains here all the year. Its food is small birds, mice, &c.

The cat owl, or small horned owl, is about as large as the chicken hawk. The colour of its head, back, wings, and the covert feathers of its tail, is brown, with some grey spots; its neck and belly are grey, with small white spots. Its head and eyes are large. It has a small bunch of feathers over each ear, which are about two inches in length. These it can erect and depress at pleasure.

They keep in pairs, and dwell in thickets and solitary places. Its habitudes are like those of the rest of the strix tribe. When roused in the day time, it flies low, and but a short distance, and alights on some tree or bush near the ground. It is easily killed.

The small grey owl, or little owl, is of a subolivaceous brown, with whitish spots above, and whitish, with brown spots beneath. The wing feathers are crossed or barred with white. Its irides

are yellow. It varies considerably in dimensions, being from six to eight or nine inches in length. The feet are feathered to the claws. It resides throughout the year, in this State.

The barn owl, is so named from its residing, occasionally, in barns or deserted buildings. Its colour is subfulvous, with grey variegations; black and white spots are down the shafts of the feathers. The breast and abdomen are white. It measures about three feet when its wings are spread out. The length, from the end of the beak to that of the tail, is about fourteen inches.

The raven is the largest species of the genus corvous, and weighs three pounds, and measures in length about twenty-two inches, and in breadth nearly or quite three feet four inches. It inhabits all parts of the State. It subsists on carrion, small birds, chickens, and other small animals. Its smell is very acute, enabling it to discriminate its favourite repast, though at a great distance. It is extremely cautious, and rarely ventures within reach of a gun. It is long lived, having been stated to live from forty to sixty years. It is easily familiarized, and may be taught several things; but it is very mischievous. It builds its nest in trees. It soars very high. They commonly go in pairs; at times, however, they assemble in flocks.

The raven is an inhabitant of every clime, from the arctic circle to the torrid zone. Its colour is black.

The crow inhabits every part of the State. It is about nineteen inches in length, and about two feet and a-half in breadth, and weighs about two pounds and a-quarter. It is black, and very similar to the raven, in form, habits and disposition. It feeds on insects, young birds, chickens, carrion, fruit, &c. It is mischievous, and commits depredations on the farmer, by pulling up his corn in the early part of the season. They usually go in pairs or small flocks. The young keep with their parents during the season. The number varies from three to five. The crow is very shy, and can seldom be approached with a gun. It seems to understand the use of that instrument, and its deadly effects. It builds its nest in the top of some tree, remote from the habitation of man.

The crow is very sagacious; always, when several are in company, one stands as centinal to give the alarm on the approach of danger. Crows, in autumn and winter, congregate in large flocks. In the latter season, they prefer a residence along the banks of a river, stream, or lake.

The blue jay is about one foot in length, and weighs seven or eight ounces. Its colour is blue, intermixed with some whitish and blackish feathers. The head is crowned with a tuft of feathers. It is not migratory. They go in pairs; in autumn, however, it is not uncommon to see them in small flocks. The jay dwells in thickets and close woods near fields. In autumn it feeds on corn, and frequently does considerable mischief. Its notes are harsh. It builds its nest in a tree, with sticks, small twigs, and grass. The young continue with their parents till the following season. Jays feed on almost all sorts of seeds and fruits, and on nuts and acorns. In winter they seclude themselves in hollow trees, where they remain the greater part of the time. In general, they are seen in greater numbers in beach woods than others, which is occasioned by the abundance of food afforded by these trees in autumn.

The woodpecker, in natural history, is a genus of birds of the order picæ.

Generic character.—The bill is straight, strong, angular, and wedge-formed at the tip; the nostrils are covered with bristly feathers, reflected downwards; the tongue is long, slender, cylindric, boney, jagged at the end, and missile; tail of ten feathers, stiff, and sharp pointed. These birds live principally upon insects, to obtain which they climb trees, and are perpetually in search of those crevices in which their food is lodged. These insects they transfix with their daggered tongue, which, when it has obtained its purpose, is, by an almost invisible motion, withdrawn wholly into the mouth. This process is incessantly repeated throughout the day. Woodpeckers have few notes, little vivacity, and animation. Ten species have been enumerated in the United States. Several of these reside in this State all the year. We shall proceed to an enumeration and description of such as we are acquainted with.

The woodcock is about sixteen inches in length, and about twenty-four or five in breadth. Its colour is a blackish brown; its crest is of a brilliant red; its bill is black; its chin, and the feathers of its nostrils are white; this colour passes in a stripe down the side of the neck, and spreads under the wings; the upper half of the wings is white; the tail is rather long and tapering; the feathers are convex above and strong. The female is distinguished from the male by having the front of the head of a light brown colour. This bird resides mostly in the large forests, and is rarely seen in those parts of the country that have been cleared and settled, for a length of time. It makes a loud cackling noise before rain.

The form of the body, wings, neck, head, bill and legs, are similar to that of the speckled woodpecker. They go in pairs, and remain here all the year. They have three or four young at a time. The woodcock is fond of corn and mast. It, however, prefers large hemlock trees, that have been girdled about a-year, to all others, no doubt on account of the larvæ. The quantity of bark which it separates from the trunk, with its bill, is astonishing, and instances are not wanting of their laying the trunks of large trees almost entirely bare. In such cases, the ground all around the roots is covered with bark.

The highhole is very common in all parts of the State. The colour of the back and wings above, is a dark umber, marked regularly and transversely, with streaks of black; the chin, cheeks and neck are a cinnamon colour; the head above, and the superior part of the neck, an iron grey; the back of the head is marked with a red spot; a large black lunule on the breast; belly and vent white, with a little yellowish, and marked with very numerous rounded spots of black; shafts of the feathers are a golden yellow; rump and tail coverts, white, the latter curiously serrated with black; tail beneath yellow, tip and all above black. Its length is ten or eleven inches, and extent sixteen or eighteen. They form hollows in old trees, in which they make their nest. The female has from four to six at a brood. They subsist on worms, insects, berries, grapes, and somtimes on Indian corn, when in its milky

and unripe state. The highhole is migratory. It appears early in the spring, and departs in October.

The red headed woodpecker is one of the most common birds in the State. Its length is eight or nine inches, and the extent about fifteen inches. The head and neck are a deep scarlet red; the back, primaries, wing coverts and tail, are black, with steel blue reflections; the rump, secondary feathers, lower parts of the back, breast, abdomen and vent, white. The young does not receive his full and perfect plumage till the succeeding spring. Like the highhole, they make a hole in some decayed tree, in which they build their nest. The female has four or five at a brood, and usually in June. The food of the red headed woodpecker is the larvæ of insects, berries, cherries, mast and corn. In some seasons they do considerable damage to corn.

They are not migratory, although seldom seen in winter. They lay up beach nuts, chesnuts, and other mast, for winter store. It is not improbable but they may at times migrate to the south. They are seen in autumn, in beach woods, gathering mast.

There seems to be three species of the speckled woodpecker: the large, the small, and the intermediate. They have a strong likeness, and apparently differ only in size. The first Catesby calls the hairy woodpecker, and the second, or smallest, the downy woodpecker.

The large speckled woodpecker is about nine inches in length, and in extent about fifteen; the head is white; the crown and broad line, which includes the eyes, and descends behind the neck to the back, black; back of the head there is a scarlet spot; a line of black spots from the base of the lower jaw, terminates in a broad black stripe on the shoulder; back black, divided by a broad lateral stripe of white, of which the feathers are loose, resembling hairs, not being webbed; wings black, spotted with white; the four middle tall feathers black, the others whitish; all beneath, pure white; nostrils concealed by numerous hairs. The female is destitute of the scarlet spot behind the head. It lives on larvæ, and occasionally on

corn, while in the milk. This bird remains with us all winter. The female has four or five young at a brood, and usually in June.

The downy or small speckled woodpecker, frequents orchards, fruit trees, &c. It lives on the larvæ of insects. Its length is about six inches, and extent about twelve. These birds are usually seen in pairs.

The speckled woodpecker, which is intermediate, is about seven inches in length, and about fourteen in extent. It is destructive to corn when in the milk.

These birds continue with us during the winter. They make their nests in holes, which they form in decayed trees. The young amount usually to four.

The bluish grey woodpecker is about as large as the blue bird. It remains with us the whole year. It is very nimble, and can descend as well as ascend the side of a tree, moving in every possible direction. In form, it differs from all the picus tribe, in several particulars, besides those mentioned.

The humming bird is a genus of birds of the order picæ. There is, we believe, but one species which frequents this State, and that is the T. colubris, or red throated humming bird. It is rather more than three inches long. Its plumage is highly splendid, and varying. It subsists on the nectar of flowers. They will suffer themselves to be approached very nearly; but on observing an attempt to take them, dart with the swiftness of an arrow. They go in pairs. We have seen them as early as the fourteenth of May.

The king fisher is about ten inches in length, and about fifteen or sixteen inches in breadth. Its head is large; its bill long; its neck, tail and legs short. Its colour is blue, with some white feathers about its neck and under its wings. It has a comb of black feathers on its head, which it can elevate at pleasure. It lives on the borders of rivers, streams and lakes. Its subsistence is small fish, which it catches by plunging into the water. It darts upon its prey with unerring aim. The king fisher makes a hole in the bank of a river, stream, or lake, in which it deposites its eggs and rears its young.

The hole extends horizontally into the bank two or three feet. The number of young which it brings forth at a brood, is four or five. It is a bird of passage, usually appearing the latter part of April, and disappearing towards the last of September. They go in couples. The young brood usually keep with the old during the season, and probably return with them to the south in autumn.

The king bird is about eight inches in length, and about thirteen in breadth. The colour of its head, the hinder part of its neck, its back, and the coverts of its wings and tail is a greyish brown; the chin, forepart of its neck, its breast, belly, and the under part of its wings and tail, a light grey, bordering upon white. It is very fierce, active and noisy. It attacks hawks, crows, and other birds, which approach its habitation. They come in May and depart in September. In the forepart of the season they are seen in pairs, and in the latter in families.

The hang bird, or red bird, is migratory. It arrives late in spring, and departs early in autumn. The plumage is black, with crimson shoulders, margined with yellow. The female has a less gay plumage. They visit all parts of the State. They construct their nest at the extremity of a limb, or among reeds, in marshy situations.

The golden robbin, or goldfinch, is a bird of passage, coming late in spring, and departing early in autumn.

The wild turkey is a native of America. In former times these birds were found in flocks, in our southern and western counties, but we believe that latterly they have mostly left the State. They are still numerous in some parts of the middle, southern and western states. In its natural state, the wild turkey is larger, more vigerous, active and beautiful, than in the domestic. They breed once a-year, and produce sometimes sixteen or eighteen. The young are very tender, and liable to injury, from cold, wet, and various other causes, which often prove fatal. This bird was originally a native of the southern parts of New-England. Our stock of domestic turkeys is probably derived from this source.

Their colour is a very dark grey, intermixed with brown and black feathers. The male is darker than the female, and has a richer and more beautiful plumage.

The common hen has been introduced in most of its varieties, and has thrived as though it had been indigenous. The same remark will apply to the guinea-hen and peacock. The latter, from their inutility, are not common.

The patridge is about thirteen inches in length, being somewhat less than a hen. It inhabits the forest, usually prefering thickets and sequestered places. It is very prolific, bringing forth ten or twelve at a brood. The young follow the dam immediately on being hatched, and before the shell is wholly detached from them. The attachment of the mother, to the young, is strong and highly interesting. On the approach of an enemy, she advances towards him, and endeavours to direct his attention to other objects, in order to allow her offspring an opportunity to secret themselves; and whenever she has diverted his attention towards herself, she moves off in an opposite direction, running first to the right and then to the left, and then direct from him. These movements she repeats, till she has succeeded in drawing him away to a distance. Man is the only being that she fails to mislead, and even him she will mislead, unless he is acquainted with her arts.

The patridge remains here all the year. In spring and summer they go in pairs, but in autumn and winter in small flocks. In general, these flocks consist of the male, female, and brood. They subsist on mast, berries, insects and buds. During winter, when the ground is covered with snow, the buds of trees seem to be their only food. The patridge is a very hardy bird. Its meat, although inferior to that of the domestic hen, is in high estimation.

The patridge is spotted. The ground colour is grey, intermixed with some white and brown, constituting a mottle. The covert feathers of the wings and tail incline most to the latter colour. The legs are blue. Experiments have been repeatedly, but ineffectually made, to domesticate this bird. Its eggs have been introduced into the nest of the hen, and hatched, but

the young, notwithstanding all the attention and care of the adopted mother, have abandoned her almost as soon as they gained an existence.

The patridge is distinguished, in one respect, from all our other birds, and that is this :—In spring the male selects the trunk of some fallen tree, surrounded by bushes, on which he mounts, and walking back and forth, stops at short intervals and drums. This he does by beating his wings against his body. During this operation he stands on his feet. The sound may be heard half a mile. This bird is improperly named. In some of the States it is called the pheasant, which name is more applicable. The patridge of the old world is a different bird.

The number of birds, in general, appear to have increased with the settlements.

The quail, which is also improperly named, is about seven inches long, being about half the size of the patridge. It is spotted, very nearly resembling the patridge in colour as well as shape. The quail is not a bird of passage. It may occasionally migrate on the approach of winter, and return in the spring, but if it does, it oftener remains here during the whole year. We have seen them in every month of the year, and in winters both severe and mild.

In spring and summer they go in pairs, but in fall and winter they assemble in small flocks. These sometimes consist of one brood, and sometimes of several.

The quail is susceptible of domestication, but when indulged with freedom, it soon betakes itself to its native solitudes.

Quails not only frequent woods and thickets, but fields.—They subsist on berries, insects, fruit, mast and buds. Their meat is considered a rare delicacy. They are found in the greatest numbers in the southern and western countries.

The field lark, or meadow lark, is about six inches in length. Its tail is short, its legs are long, its body short, round, and shaped somewhat like that of the quail. The colour of its back, and the covert feathers of its wings and tail is grey, with some brown and yellow. Its belly and breast are speckled.—

It lives in meadows and thickets. It is melodious. The lark is a bird of passage. It departs in the early part of autumn, and returns the latter part of April, or the beginning of May. In spring they are seen in pairs, but in fall, in families of five, six, or seven. The brood consists of four or five.

The lark builds its nest on the ground, in some thicket, or tuft of grass.

The sky lark comes late in the spring, and departs in September.

The robbin is somewhat smaller than the blue jay. Its head, neck, back, and the covert feathers of its wings and tail are a dark grey, bordering upon brown, and the breast and belly red. It is very melodious, particularly in spring.—Its notes are soft, sonorous, and musical, and very agreeable to the ear. They go in pairs. The young, amounting to three or four, usually remain with their parents during the season.—The robbin is a bird of passage: it arrives early in spring, and departs late in autumn. It is a hardy bird, and instances are not wanting of its remaining with us all winter. We have seen it in December and January.

They, since the country has been improved, dwell mostly in the inhabited parts, and often near the habitation of man.

The robbin is a harmless bird. When domesticated it is active, lively, and playful. It inhabits almost every part of North America. The species have multiplied exceedingly since the country has been cleared. This we attribute to an increase of food. The young do not receive their perfect plumage before the following season.

The robbin has been known to return to the same tree, and to have its nest on the same branch, for several years in succession.

The thrush is nearly, or quite as large as the crow black bird. Its head is small; its neck and body slender; its tail long, and its wings short. The colour of its plumage, on its back, wings, tail and head, is a yellowish brown, intermixed with some grey; its breast and belly are spotted, the ground being grey, interspersed with whitish spots. The thrush in-

habits thickets. It is a bird of passage. Its notes are musical. It generally sings towards evening. It seldom ventures far into the fields. It is a timerous and solitary bird, delighting in sequestered places. Thrushes go in pairs. The young remain with the parents till their departure.

The wood thrush (turdus melodes) is a bird of passage. It makes its appearance late in spring, and takes its departure early in fall. They are seen in pairs.

The thrush, or mock bird (turdus polyglottus) is migratory. They go in pairs. They live in thick woods, and usually near clearings. They come late, and depart early.

The common black bird, or crow black bird (turdus merula) is perfectly black. The males are distinguishable from the females by their size, and a beautiful glossy black about their necks, and on their breasts, which changes according to their position. In spring, and during incubation, they live in pairs. The young remain with the parents till they are able to provide for themselves. The brood usually consists of three or four. In the latter part of summer, and the early part of autumn, they congregate in flocks. Some of these are very numerous. This seems to be preparatory to their departure for the south. They depart in the forepart of October.

The black bird prefers the cultivated parts of the country. It is a very mischievous bird. In May and June it commits great ravages in corn fields, by pulling up the corn. In fall it feeds on corn. Its ordinary food consists of worms, grass-hoppers, and insects.

The black bird is full of melody. Its notes, however, are harsh, and not very pleasing to the ear.

There are three other birds which annually visit us, which are called black birds.

The first is about as large as the robbin. Its form is like that of the crow black bird. Its colour is a very dark brown, approaching to black. In spring and summer they are usually seen in pairs. In fall they gather in small flocks, at which time they pray on corn in the fields. These birds arrive later, and depart earlier than the preceding.

The second is the red winged black bird, so called, because it has some red on its wings. It is smaller than the foregoing. It inhabits swamps, marshes, and along small streams, bordered by meadows, and fringed with small trees. Its songs are melodious. They come late and depart early, and are commonly seen in pairs. The female is less than the male, and has no red upon its wings.

The third does not differ much from the second in size. It has some white, tinctured with yellow, on its head, neck, back, and wings. It dwells in meadows, swamps and marshes, and is musical. They come late and depart early. We have seen them, and the red winged black bird, on the tenth of May.

The barn, or house swallow, arrives usually in April, and departs the latter part of September, or the forepart of October. They live in pairs; several of these are, however, to be seen about the same barn or house. Its colour, except the rump and vent feathers, which are red, is a dark brown, bordering on black. The head and neck, and the covert feathers of its wings, are tinged with a delicate silky gloss. They build their nests with mud, grass and sticks, in barns and deserted houses. The young amount to three, four or five. The number of swallows increase with the improvements. This is occasioned by an increase of food, and greater security.

The chimney swallow does not differ materially in dimensions from the preceding. Its colour is brown, approaching to black. The tail feathers are of equal length, naked and subulated, or pointed at the end. They go in pairs. They build their nests in chimneys, with twigs and cement, on the sides of the walls. The young amount to three or four. The chimney swallow appears in the spring, before the barn swallow. Its flight, in autumn, is in the early part of October.

The barn and chimney swallow subsist on insects, which they catch upon the wing, and devour without lighting. They are almost constantly on the wing during the day. They fly with astonishing celerity, and seem capable of living in the air. Their manners are social. They are harmless birds.

The ground bank, or river swallow, is about as large as the

preceding. It is so called, because it digs a horizontal hole in the bank of a river, stream, or lake, or other collection of water, where it makes its nest. The banks which it selects, are either perpendicular, or very steep, and consist of sand, sandy loam, argillaceous loam, or fine river alluvion. Its hole is two or three feet in length. It builds its nest at the extremity. They go in flocks of several hundreds, nay, thousands. Each couple have their separate apartment. In some places the banks are perforated to a considerable distance. In these retreats they are, in general, secure from every danger. Here they breed and bring up their young. Bank swallows invariably repair to the same place, unless disturbed.

The head, neck, back, and covert feathers of the wings and tail, are cinerous, and the chin and belly white. The ground swallow is sprightly, active, and quick on the wing. In form it very much resembles the barn swallow. Great numbers are annually to be seen in the vicinity of Schenectady. The banks of the Mohawk, at this place, consisting of fine alluvions, seem particularly inviting.

The black martin is considerably larger than the barn swallow. Its body and wings are much shorter in proportion to its size. The colour is a glossy black, inclining to brown. It is a gay, lively and musical bird. It is almost all the time on the wing. They go in pairs, however, when circumstances will permit, several families reside under the same roof, in separate apartments. They are fond of living near the habitation of man, and rarely fail to occupy such tenements as he prepares for them. They have from two to four at a brood, and usually hatch once while they remain with us. The martin makes its appearance in April, and takes its departure in September. It is a social and intertaining bird. Like the swallow, these birds have increased in numbers since the country has been improved. They come between the first and middle of April. On a recurrence of cold, which almost always happens, they disappear, but re-apper on its abatement.

Some very absurd opinions have been formed concerning the hybernation of the swallow. Among these, some have

imagined that they retire to the bottoms of rivers, ponds and pools, where they bury themselves in the mud, and remain torpid till warm weather, in spring; and others, that they betake themselves to the hollows of trees, or cavities in the banks of rivers, where they fall into the lethargic state, in which situation they continue till warm weather. How such ridiculous stories should ever have gained credence, is matter of surprise. Swallows, like other birds of delicate habits and constitutions, upon the approach of cold weather, retire to the south, where they spend the winter. The countless numbers seen in the southern regions, from October to April, seem a sufficient refutation.

Swallows do not return on particular days, as some have alleged. In their comings and goings, they are regulated by the weather. If the heats are early, and continued, they come sooner, and it is the same in respect to their departure. They cannot endure much cold. Hence, whenever there is a recurrence of cold after their arrival, numbers die.

The pigeon is a migratory bird. In spring they pass to the north, where they spend the summer, and in autumn they return to the south, where they spend the winter. The periods of their arrival and departure are not well defined. Sometimes they come as early as the latter part of March, while at other times, a month later. This seems to depend on the season, their arrival being earlier or later, according to the forwardness or backwardness of the spring. They pass in their periodical migrations, in flocks, which vary greatly in numbers. Some extend a mile or two in length, and consist of a countless multitude, while others are small. The flocks are often seen following each other in quick succession, and at short intervals. These migrations frequently continue for several days.

After their arrival, they remain in flocks, for a short time, and then disperse in pairs in order to breed. They build their nests on trees, and usually have two young at a time. They hatch every month. They subsist on mast, wheat, peas, oats, rye and insects.

The pigeon is of a light bluish cinerous colour—the neck and breast of the male is dashed with a beautiful purple, of a

changable hue. The covert feathers of the wings and tail are marked with some blackish spots and bands—the end of the tail feathers is tiped with white.

They are rather smaller than the domestic pigeon, and are good food. The domestic and wild pigeon do not breed together.

The accounts which are given of the number of pigeons in the uncultivated country, will appear almost incredible to those who have never seen their nests. Sometimes they occupy several hundred acres with their nests. Twenty, and even thirty nests have been counted on one tree.

The turtle dove is some smaller than the pigeon. They come late in the spring, and depart early in autumn. They go in pairs, and are never seen in flocks. It is a timersome, and solitary bird, usually keeping in woods and thickets. The voice of the male is soft, plaintive, and impressive. They seldom venture into the fields. The dove, from time immemorial, has been an emblem of innocence.

The domestic pigeon was originally imported from Europe. This bird, has not, as we have yet learned, returned to a state of nature. In the old world, they are migratory, like the wild pigeon. In Egypt and Persia, they are reared in great numbers, and among good farmers, constitute a part of the establishment.

The snow bird is rather larger than the wren. It is of a bluish grey colour, with some white and black on its head, wings, tail and belly. They usually go in pairs in summer, and small flocks in winter. They inhabit the most gloomy recesses of the forest. The snow bird continues with us all the year.

The yellow bird, so called from its colour, remains here all the year. On the approach of winter, its colour changes to a light grey. In summer they are yellow, with some black on their wings, back and tail The plumage of the male has a higher and richer colour than that of the female. In summer they are seen in pairs, and in winter in flocks.

There are three kinds, they build their nests in bushes, thickets, &c. In general, these birds choose the inhabited country.

They are distinguished by the names, yellow bird, gold finch, or lettuce bird, lesser gold finch, and least gold finch.

The blue bird is migratory. It makes its appearance early in spring, and its departure late in autumn. In size, it does not vary much from that of the house swallow. They go in pairs, and prefer the cleared lands. Its plumage, except the breast, which is red, is mostly blue, whence its name. In spring, its warbling notes add much to the beauty of the landscap. They build their nests in thickets and coppices. The brood consist of four or five—they remain with their parents during the season. These birds, it appears, have increased in numbers with the improvements.

Sparrows—There is the winter sparrow, the red fox coloured, ground, or hedge sparrow, and the large brown white throated sparrow.

There are three kinds of chipping birds which belong to the sparrow family—they are less than the blue bird. Their colour is mottled, the ground being grey, intermixed with brown and white. They are birds of passage, appearing just after the snow has gone off.

The largest approaches in size to the blue bird. Its notes are melodious. The others are nearly of the same colour.

The wren is a bird of passage—in size it ranks among our smallest birds. The colour of its head, neck, back, wings and tail, is brown, and its breast and belly grey. They go in pairs, and build their nest in the hollow of some tree—the brood consists of four or five; they live on flies, insects, &c. In spring they appear very soon after the snow has gone off.

The same fabulous stories have been propogated about the torpidity of the wren, that have been about the swallow, but they appear too absurd to require refutation—like other birds of delicate habits, the wren, on the approach of cold in autumn, retires to the south, to climes adapted to its nature. The wren, in spring, is sprightly, gay and musical. Its notes are harsh, and not very pleasing.

The cat bird is somewhat smaller than the robbin. Its col-

our is like that of slate, or a dark mouse colour, except the vent feathers, which are red. In form it resembles the robbin, only its tail is longer in proportion to its size—they go in pairs, and dwell in thickets. They, like most other birds, prefer a residence adjoining to a field. The periods of its arrival and departure, are April and September. The same couple return in succession, to the same place, and build their nest on the same bush or tree, nay, in the same place, for years—the young amount to three or four; the notes of the cat bird are harsh, and devoid of sweetness.

The red bird is the most beautiful bird that adorns our landscapes. It is less than the cat bird. Its plumage is a deep red, except some black on its wings. They are seen in pairs—they are migratory, arriving late in the spring, and departing early in autumn. It builds its nest on the extremity of the bough of some tree with a thick top. The melody of its notes do not correspond with the exquisite beauty of its plumage.

The whipporwell is a very singular bird; it comes in May, and departs in September—we aver this, because it is never heard before or after those periods. Its voice is loud, shrill, and somewhat like a whistle. It is a nocturnal bird, and but rarely seen. The general opinion is, that it is the same bird which is called the night hawk: this opinion, we think, not to be well founded. The night hawk is frequently seen by day, flying for hours, and not always solitary, or even in pairs, but but by dozens, especially before storms. The whipporwell is heard alone, or at most, only in pairs, and these so distant, that it is seldom that we hear two in different directions. If the night hawk be the whipporwell, we ought to hear a dozen or twenty at once, in different directions, because the numbers would warrant this.

The night hawk is a dark brown bird, with white spots on its wings; its head is large, its neck short and thick, its wings long, and tail moderately short—its legs are also short: when it flies, its movements, in some respects, resemble the chicken hawk. In size it nearly corresponds with that bird, but its wings are considerably longer. It sails and dives, but in both, it is

much less regular, none of its movements being so graceful as those of the hawk. It is occasionally seen upon trees and fences during the day.

The boblincoln is a beautiful bird, of a small size—its plumage is black, with some white on its wings; they go in pairs while here—they come in April or May, and go away in September.

The phebe bird comes in spring and departs in fall. It is about as large as the chipping bird, already described by us.

The red fox coloured sparrow, and the large brown white throated sparrow, are also birds of passage; they come late in spring and depart early in autumn—they dwell in thickets and woods filled with under brush—they live in pairs, and are rarely seen in the openings.

The stork is nearly, or quite of the dimensions of a turkey, and of a white colour. It dwells in various parts of North America, avoiding the extremes of heat and cold. It inhabits our coasts. It is a bird of passage, leaving our coasts in autumn for more southern latitudes, and returning in spring. They are seen in pairs and flocks. In their migrations they assemble in great numbers. It is supposed that they have annually two broods, the first towards the north, and the latter towards the south. The female lays from two to four eggs. The young are hatched in a month; the male and female watch them by turns, till they can provide for themselves. The stork's food consists of snakes, and other reptiles, &c. hence the veneration of the ancients for this bird.

The little white heron comes in the spring, from the south, and returns in autumn. It is seen about New-York, Long Island, Staten Island, &c. Its length, when full grown, is nearly two feet. The body is entirely white; the occiput crested; the plumage of the upper part of the back is elongated and silky; the bill black; the toes and legs greenish. It has a tuft of very slender and glossy feathers on the under part o the neck. The iris is a bright yellow.

The great white river heron arrives in the spring, from the south, and returns in autumn. The head is crested; the occiput,

or hinder part of the head and back, is a black green; the abdomen, a yellowish white. Its length is about twenty inches, and the extent of its wings about three feet two inches. At night, when it goes abroad in quest of food, it utters a very disagreeable croaking noise, resembling the straining of a person in the act of vomiting. During the day it conceals itself among reeds, trees, rocks, &c. It inhabits that part of America, between Hudson's bay and Louisiana. The female constructs her nest on the ground, among bushes and rush grass.

The grey white crested heron is a bird of passage. It comes in spring from the south, and returns again in autumn. The full grown male measures about two feet four inches in length, and three feet ten inches in extent of wing. The plumage is testaceous, with transverse spots above, paler, with oblong spots beneath. It is a shy, solitary bird, usually living among the reeds and rushes of marshes. When caught, it evinces to defend itself with great resolution. Its bill is its chief weapon of defence.

The green bittern, shite poke, or skouk, is of a slate black colour. It lives along rivers and streams, and around lakes and ponds. It arrives in spring and departs in autumn. Its length is about sixteen inches, and its breadth about twenty-two. The bill is large, the head of moderate size, the neck long, the body small, the wings are large, and the legs small. It lives on fish, which it catches by plunging into the water. They are not gregarious. Its tail is very short.

The wood snipe inhabits woods and woody places. It is a bird of passage.

The meadow snipe resides in marshes, meadows and other low situations. It is migratory coming in spring and departing in fall.

The wild swan measures five feet in length, and above seven in breadth, and weighs from thirteen to twenty pounds. The bill is about three inches long, and of a yellowish white; from the base to the middle, and thence to the tip, it is black; the bare space, from the bill, over the eye and eye-lids, is yellow: the whole plumage, in adult birds, is of a pure white, and next

to the skin, they are clothed with a thick fine down: the legs are black. The species generally keeps together in small flocks, or families, except in the pairing season, and at the setting in of winter. At the latter season they assemble in large flocks, particularly in the northern parts of America. But when the cold becomes excessive, they shape their course to the south, in small flocks, in search of milder climes. In such seasons they are seen in some parts of this State. They do not, however, remain longer than the approach of the spring, when they again retire northward, towards, and at the arctic regions, to breed. A few, we believe, stop short, and perform that office by the way, for they are occasionally seen round the lakes in the northern forest, lying between the Mohawk and St. Lawrence rivers.

Great numbers are seen in the rivers and lakes, near Hudson's bay. They are said to return to the latter place in flocks of about one hundred at a time, in the spring.

The natives kill the young in August, when they are in moult, and unable to fly. The flesh is highly esteemed, as are also the eggs. The Indians dress their skins with the down on, sew them together, and make them into garments of various kinds: they sometimes weave the down, and then manufacture it into ornamental dresses for the women.

The voice of the swan, singly, is shrill, piercing, and harsh, not unlike the sound of a clarionet when blown by a novice in music.

Swans feed on grass and weeds, and the seeds and roots of plants, which grow on the margins of the water—on insects, which skim over or float on the surface—and also on small fish.

Swans are occasionally seen in spring, on the Mohawk, on Seneca and Cayuga lakes, &c. Within two years several were shot near Whitesborough, in Oneida county.

The wild goose is another species of the same genus. In some countries it has been reclaimed from a state of nature, and domesticated. It breeds, and is as familiar as the common goose. The form and size are analogous to the domestic goose. Its neck, head, and legs are, however, longer, and its body and

wings more slender. The colour is cinerous, or an ash grey; the head and neck are black; the cheeks and chin are white; also the vent and tail covert feathers.

The vernal flight of wild geese lasts from the latter part of March, or the beginning of April, to the first of May. Their first appearance coincides with the dissolution of the snow, the thawing of the ground, and the breaking up of the rivers, &c. The autumnal, or the season of their return with their young, is from the middle or latter part of September, to the last of October, or the first of November. Very few of these animals remain during the summer with us; and these few live in the forest, between the Mohawk and St. Lawrence. Those usually seen seldom light, being bound either for the regions about Hudson's bay, or those regions lying to the south. At times, however, they halt at some of our rivers, ponds and lakes, and make a short stay. In their journeys, whether to the north or south, they go in small flocks. These flocks, whether large or small, form themselves into a kind of triangle, and are preceded by a leader, whose station is at the very point or angle, and who always goes foremost. They usually fly very high. They have considerable celerity, and can support themselves for a long time in the air.

The natives around Hudson's bay, yearly kill great numbers, and lay them up for their winter food.

The wild and tame geese breed together. The offspring, however, is hybrid, and from its barrenness, affords unquestionable evidence of the distinctness of these two species.

The brent goose is brown; the head, breast and neck are black; the latter with a lateral white spot; the tail coverts and vent are white. They abound on the sea coast in autumn. It is considered by Mr. Wilson, as the same with the barnacle goose. It weighs about five pounds, and measures more than two feet in length, and nearly four and a-half in breadth.

The eider duck is of a size between the goose and domestic duck, and appears to be one of the graduated links of the chain which connects the two kinds. The full grown old males generally measure about two feet two inches in length, and

two feet eight inches in breadth, and weigh from six to above seven pounds. The female is nearly of the same shape, though less than the male, weighing only between five and six pounds; but her plumage is quite different, the ground colour being of a reddish brown, prettily crossed with waved black lines; and in some specimens the neck, breast and belly are tinged with ash; the wings are crossed with two bars of white; the quills are dark; the neck is marked with longitudinal dusky streaks; and the belly is deep brown, spotted obscurely with black. The eider duck lays from three to five large, smooth, pale, olive-coloured eggs. They keep together in small flocks, in the open parts of the sea, adjoining the State fishing, in quest of shell fish, and other food; and when they have satisfied themselves they retire to the shore, whither they at all times repair for shelter, on the approach of a storm. The eider duck is found south and north of the State. The great body of these birds, however, constantly resides in the remote northern climates.

The scaup duck, or blue bill, is only met with on our shores during winter. In spring it repairs to Hudson's bay, and other cold regions. It is about eighteen inches in length, and thirty in breadth. The bill is broad and flat, more than two inches long, from the corners of the mouth to the tip, and of a fine pale blue, or lead colour, with the nail black; the irides are a bright deep yellow; the head and the upper half of the neck are black, glossed with green; the lower part of the latter and the breast are of a sleek plain black; the throat, rump, upper and under coverts of the tail, and part of the thighs, are of the same colour, but dull, and more inclining to brown. The tail, when spread out, is fan-shaped, and consists of fourteen short brown feathers. The legs are short; the toes are long, and as well as the outer, or lateral webs of the inner toes, are of a dirty pale blue colour; all the joints, and the rest of the webs are dusky. These birds are said to vary greatly in their plumage as well as size.

The golden eye is about eighteen inches in length, and about thirty in breadth. The weight varies from one pound

and a-half to two pounds. They are frequent in the waters of this and the other Fredish States during the winter, and take their departure northward in the spring. They are excellent divers, and seldom set foot on the shore, except in the breeding season. These birds do not congregate in large flocks; they are varied with black and white; the head is tumid and violet; at each corner of the mouth there is a white spot.

The shell drake is found in the waters of this State. There are several species. It is very common in those parts of America, situated in higher latitudes. The bill is serrated, slender and hooked at the point; the nostrils are small, oval, and near the middle of the bill; the feet are fore toed, the outer one before, longer than the middle one.

Some of the species weigh from three and a-half to four pounds, and are from twenty-four to twenty-eight inches long. They fly near the surface of the water, and with great apparent vigour. They subsist mostly on fish.

The wild duck, or mallard, is of a cinerous colour; the middle tail feathers of the male are recurved; the bill is straight; the collar is white. Its length is about twenty-two inches; the extent of its wings about two feet ten inches, and weight about two pounds and a-half. The female is of a more somber brown hue, as are the young males before the first moult. But as there are several varieties, it is not easy to give a description applicable to all. They, in general, migrate to the north in the spring, and return southward in autumn. They frequent lakes, ponds, rivers and marshes—lakes Ontario and Seneca, as they never freeze, subsist myriads in winter, especially the first. At times the bays and coves teem with them. Wild ducks are naturally very shy, and are with difficulty taken. The female has six, seven, or eight at a brood. They swim with grace and elegance. It is interesting to see them sporting and swimming on the rapids above Niagara Falls, and even descending one-third, or half-way down the cataract, and then flying down the chasm, or mounting above. The wild duck is susceptible of domestication, but when kept at a distance from running or standing water, degenerates in strength,

beauty and flavour. They feed on animal and vegetable substances.

The wood duck is nearly of the size of the common domestic duck. It inhabits various parts of the State. The species are not numerous. It migrates in autumn to the south, and returns in spring. These ducks abound in the countries around the Chesapeake bay.

The loon is found in the lakes and ponds in the northern parts of the State. It will swim under the water one hundred yards, and is caught with extreme difficulty. It is about three feet and a-half in length, and weighs fourteen or fifteen pounds. It keeps most of the time in the water. In autumn they pass to the south. They inhabit on the borders of the ocean, as well as the lakes. They subsist on fish, &c. The bill is toothless, subulate, straight and pointed; the nostrils are linear.

The Gull—Several species inhabit the waters of this State, such as the great white gull, the great grey gull, the little white river gull, the mackerel gull, the fishing gull, &c. The birds of this genus are found in almost every maritime country. Flocks of them resort to the shores of the ocean and lakes, in pursuit of fish. In the winter, when the shores of Lake Ontario are ice bound, hundreds repair to the Falls of Niagara, where they find abundance of fish, that have been killed in descending the rapids and falls. Gulls, though frequently on the wing, occasionally repose either on the surface of the water, or on the shore. They breed among the rocks or downs; and some of the smaller species, in meadows and grounds adjacent to the ocean or streams. They are qualified for easy, rapid and extensive flight. The flesh, of most of them, is fishy, tough and repulsive.

Black backed gull, great black and white, or great black backed gull. This is the largest species of the genus, weighing nearly five pounds, and measuring about thirty inches in length. It is often seen on our coast. In very cold weather they congregate in small flocks. The shoulders are slate black, the legs white; the length of the tarsus nearly three inches; the folded wings stretch a little beyond the tail; the quill feathers

are black towards the end, but tipped with white. It lives mostly on fish. It is very ravenous.

The mackerel gull is found in the marshes and fens on the coast, and along the borders of the ocean. The mantle is a clear cinerous colour. There is a large white space on the middle of the primary quills. The length of the tarsus is one inch and eight lines. Its length is fourteen or fifteen inches. In different countries it has different names, such as the laughing, black headed, or pewit gull, &c.

The fishing gull seems to belong to a different genus. The number of species exceed twenty-five, but only a few inhabit our waters.

Generic character of the gull.—The bill is straight, pointed and slender; the nostrils are linear; the tongue slender and pointed; the wings are very long; the back toe is very small; and the tail forked. They live on fish, insects, &c. They sometimes dart upon their prey from a considerable height, and at other times skim the surface of the water in the manner of a swallow.

They dwell on the sea coast, and along lakes and rivers.

Alca—The water hen is found on the coast. They come in March or April, and depart in August or September.

The water hen inhabits the ocean bordering upon this State, and thence northerly. They are sometimes seen in large flocks. The bill is compressed and two edged; the upper mandible has three grooves, and the lower two; the orbits and temples are white, the upper eye-lids are daggered, or furnished with a pointed callus. The male and female have the crown of the head, all the upper parts, and a broad collar, deep and glossy black; the quill feathers, dusky brown; the breast, belly and lower parts, pure white. The bill, which imparts such an air or appearance of novelty to this bird, varies considerably according to age; for in the first year it is small, weak, destitute of any furrow or sulcus, and dusky; in the second year, it is larger, stronger, of a paler colour, and discovers a faint vestige of a sulcus near the base; but in the third, and more advanced years, it exhibits great strength and vivid colours. The water hen is about one

foot in length; the extent of the wings about twenty-one inches, and weight about twelve ounces. They rise with great difficulty; but when once they get wind, they fly very well. They are sometimes driven ashore by sudden gusts of wind, and then they are easily taken. They deposite their eggs in holes, where the soil is light; but where the coast is abrupt, they lay them in holes and crevices in the rocks. The flesh of the old bird is rank and fishy; but the young ones, which are seized before they are quite fledged, are much relished by some.

The crane is about five feet in length, and about six feet in breadth, and weighs nine or ten pounds.

The bill is about three inches and a-half long, straight, and of a blackish colour; the crown of the head is covered with soft black feathers like velvet.

The colour of this bird is a slaty black. The neck is long and slender; the body is small, the wings are long and large; the tail moderately short; the legs and thighs long and small. Upon the whole, it is an uncommonly tall, slender bird. When walking it appears to be going upon stilts. It is slow in getting upon the wing, and is rather a clumsy flyer. The crane dwells round lakes, ponds, and mill dams, and along rivers, prefering marshy places. They are shy and not easily approached. They are usually seen in pairs. They build their nests on the ground, near the water. The number of the young are said to be two or three. Their food is fish, insects, &c. Cranes are migratory, arriving in April or May, and departing in September or October.*

The mud turtle is of a blackish colour. Its length, from its snout, to the end of its tail, rarely exceeds fifteen inches, and its breadth five or six inches. Its tail is nearly half the length of its shield, and is stretched out when it walks. Its neck and head are not over one-third the length of the shield. The shape of the head resembles that of a snake. The shield is a kind of oval. The breast plate is shorter than the shield. The tail,

* Some of the foregoing remarks on birds, are taken from Nicholson's Encyclopædia, American edition.

legs, feet and neck are covered with a kind of scales. It has the power of distending, and retracting its head tail and legs. These when retracted are covered by strong fleshy webs, resembling curtains. The size of this animal differs greatly; some are much larger, and others much smaller than the dimensions given above. In truth, it would be impossible to say what size it would attain under favourable circumstances, since the period of its existence nearly or quite equals that of man.

The mud turtle inhabits brooks, creeks, rivers, ponds and lakes. They prefer the muddy places, because these abound more with rush grass, flags, pond lillies, &c. and afford them greater security from their enemies. They frequently come on land and make small excursions. Both elements seem indispensible to their existence. They subsist on fish, worms, snails, &c. The only sound it can utter is a kind of hiss.

On the approach of winter, turtles imbed themselves in the mud of some stream, pond, lake, or other collection of water, at or near the shore, where they fall into a state of insensibility, and appear in a deep sleep scarcely distinguishable from death. In this state the circulation of the blood is languid, and respiration slow and difficult. Thus circumstanced, they in general continue till the return of warm weather in spring, when they gradually recover motion, free respiration, and their former strength and vivacity.

In the month of March, 1822, we saw two mud turtles on the flat near the village of Herkimer, that had been removed about three-quarters of a mile by the waters, on the breaking up of the West Canada creek. They had burrowed in a small muddy pond, which was formerly a part of the bed of that creek, and had been washed up by the waters. Both were alive, but so feeble, that they could not walk, nor even distend their heads, legs and tails. Their heads, however, were just protruded from the web, or membrane which covered them, when retracted within the shell. The shields were covered with pastes of mud. There was also some mud on the breast plates, and between these and the shields. They seemed to be sensible of their helpless condition, but this was all: they had no power of lo-

commotion any more than stones. The weather was mild, but not sufficiently warm to give them vivacity.

The river turtle dwells in rivers, creeks, lakes and ponds, and occasionally grows to a large size. The following are the dimensions of one taken in the West Canada creek :—the shield was thirteen inches in length, and eleven in breadth, and its length, from the point of its nose to the end of its tail, was two feet eight inches. Its weight sixteen pounds In the Hudson, and some other waters of this State, the river turtle is much larger.

The shield of the river turtle is large, and the breast plate small. The former is blackish and the latter whitish. Its feet are each armed with five claws. The shield and breast plate do not form a complete cover, as is the case with those of the mud turtle. Like the latter, it passes in autumn into the torpid state, in which condition it continues till revived by the warmth of spring.

Frogs—The tree frog, is so called, because it has its habitation in trees. Its body is slightly compressed, elongated and smooth. Its tongue is short and thick; its two fore feet are furnished with four toes; its hinder with five; and all of them without claws; but terminated with lenticular tubercles.

Tree frogs breed in the water. In the pairing season, the male makes a loud, shrill, croaking noise. The croaking is louder in the evenings on the approach of rain. There are several species. In autumn tree frogs repair to brooks, creeks, rivers, pools, ponds and lakes, where they burrow in the mud, and remain torpid till the ensuing spring.

The common frog inhabits all parts of the State. Its body is thick, a little compressed, elongated, and covered with a few small tubercles; generally granulated below, except at the thorax, which is smooth; on each side of the back, above the loins, there is in some species a longitudinal angular fold; the tongue is short and thick; the fore feet have four separate toes, with the thumb a little longer than the rest, in the male; the hinder feet are almost always palmated, and are much longer than the body; the toes are pointed, and have usually a small tubercle under each articulation.

Common frogs inhabits swamps, marshes and bogs, and the borders of lakes, ponds, rivers and streams. They breed in the water. Both elements seem necessary to their existence.—Frogs can remain for hours, and even days, under the water. It seems that in this respect they have the power of suspending the respiratory organs.

They make their appearance in spring, immediately after the snow has gone off, and the frost come out of the ground. Their appearance is announced by their croaking at night.

On the approach of cold weather in the fall, they retreat to the bottoms of ponds, lakes, streams and rivers, and inhume themselves in the mud, and then fall into a state of torpidity, from which they do not arise till spring.

Frogs subsist, for the most part, on worms and insects. The common frog varies considerably in size. Those found in marshes and stagnant waters are larger than those found in swamps.

The bull-frog is much larger than the last species, and abounds in many parts of the State. Its sounds has a faint resemblance to the lowing of a bull, and are heard a considerable distance. Like the common frog, on being surprised, it makes two or three leaps, and plunges into the water, where it is secure from molestation. They usually dwell in marshy and boggy places, around lakes, ponds, and other stagnant waters, fringed with rush grass, pond lillies, and flags. The outlets of Ballston and Saratoga lakes furnish two good examples.

There is another species of frog, which is rather smaller than the common frog. Its body is more slender, its head is longer, and its nose more pionted. The colour of its body is brown, and belly a light grey. Its feet are webbed. It lives in swamps, marshes, meadows, and other moist places. It is more agile and active than any of the other members of the frog family.

Toads—We are acquainted with but three kinds, the brown, black and yellow.

The land toad differs greatly in size, some equalling the bull frog, while others are less than the common frog. It is of a brownish colour on the head, back, sides, and the exterior of its

legs; its throat, neck, belly, and the interior of its legs, are a light grey, with some white, forming a mottled colour. The body and legs are short and thick: the fore feet have four toes, and the hinder five, all furnished with small nails. The head, neck, back and sides, are tuburculated, or full of nobs. The toad is a dull animal. It is common to uplands. It lives on flies and insects.

Upon the approach of cold weather, it secludes itself under rocks, or in the earth, where it falls into a lethargy, in which state it continues till spring.

These animals will, when unmolested, reside in the same place several years.

The water toad, or swamp toad, is smaller than the common frog. It is of a pale yellowish colour. Its body and legs are slender. It is nimble and sprightly. It inhabits swamps and marshes.

All of the preceding animals pass about one half of the year in torpidity; a state, comparitively, but a single remove from death.

"There are some well authenticated accounts in natural history, of toads being found enveloped in trees and rocks. In the memoirs of the French Academy of Sciences, there is an account, that in the year 1731, a toad was found in the heart of an old oak tree, near Nantz, without any visible entrance to its habitation. From the size of the tree, it was concluded, that the toad must have been confined in that situation at least eighty or one hundred years. When taken it soon became reanimated.

"In Vermont, frogs have been found buried in the earth at considerable depths. At Windsor, on Connecticut river, a living frog was dug up, at the depth of nine feet from the surface of the earth. The place was about half a mile from the river, on intervale land, which is annually overflowed.

"At Castleton, in 1779, many frogs were found at the depth of five or six feet below the surface. They were torpid when taken out of the ground, but on exposure to the air, they soon showed symptoms of animation, and became lively and active.

"In the year 1788, on digging a well at Burlington, a short distance from Onion river, several frogs were found at the depth of twenty-five or thirty feet from the surface of the earth. At first the labourers thought them to be ground-nuts, or stones, covered with earth Upon examining these appearances, they were found to be frogs, to which the earth every where adheared. The examination was then made of the earth in the well where they were digging. A large number of frogs were found covered with the earth, and so numerous, that several of them were cut in pieces by the spades of the workmen. Being exposed to the air, they soon became active; but unable to endure the direct rays of the sun, the most of them perished. From the depth of earth with which these frogs were covered, it cannot be doubted, but that they must have been covered over in the earth for many ages, or rather centuries. The timber on the adjacent land, had grown very large; a pine tree, not far from the well, was more than twelve feet in circumference. The appearances denote that the place from whence these frogs were taken, was once the bottom of a channel or lake, formed by the waters of Onion river. In digging the same well, at the depth of forty-one feet from the surface, the workmen found the body of a tree, eighteen or twenty inches in diameter, partly rotten, but the biggest part sound. The probability is, that both the tree and the frogs were once at the bottom of the channel of a river or lake; that the waters of Onion river, constantly bringing down large quantities of earth, gradually raised the bottom; that by the constant increase of earth and water, the water was forced over its bounds, and formed for itself a new channel, or passage in its descent into Lake Champlain."

Williams' History of Vermont, vol. 1, *pages* 152, 153, 154.

LIZARDS.

There are several species of lizards in this State. We shall enumerate the following:—

The brown lizard is from seven to nine inches in length. It inhabits swamps and streams. Its skin is smooth. The head

is triangular, resembling that of a snake; the nose is long; the neck small; the tail long, nearly or quite equalling the body. Its legs are short, and it walks with difficulty. When the water, it swims with some celerity. Both elements are necessary to its existence.

The yellow lizard, called by some the copper-coloured lizard, is less than the preceding. Its form is very similar to that of the brown. They live in swamps, marshes, and other wet places. Its back is marked with lines of dark spots.

The striped lizard is four or five inches in length. Its colour is red and white. The former colour predominates. This species dwells wholly upon the land, and is usually found under old logs, brush, leaves, and other rubbish. In the forests they are numerous.

Lizards, on the approach of cold weather, burrow in the mud, or under logs and rocks, where they fall into a stupor, or state of insensibility, from whence they do not arise before warm weather, in the ensuing spring, resembling, in this respect, the turtle, the frog, and the toad.

SERPENTS.

The rattle-snake is from two and a-half to four feet in length, and of a yellowish brown colour. The rattles are fixed at the end of the tail, and are composed of dry and hollow bones, nearly of the same form and size, connected by joints. It is said that it has an additional bone, or ring, every year; but be this as it may, the number varies from three to twenty, and upwards. The rattle-snake moves slowly, and seldom bites unless provoked by wounding, or otherwise. Its bite is not only poisonous, but fatal, and has been known to occasion death in a few minutes. The teeth with which it inflicts the deadly wound, are two in number, and situated in the upper jaw. It never uses these teeth but when irritated. They are crooked, long, sharp, slender and hollow, and perforated at the points. The poison is contained in glands, which lie over the roots of the teeth. These glands being compressed in the act of bit-

ing, force the poisonous liquid through the hollow of the teeth, into the wound, whence it enters the blood, and is diffused through the whole system.

The rattle-snake, before it bites, throws itself into a coil, or spiral figure, with its head erected from eight to twelve inches, and then darts at the object of its vengeance.

They make their appearance in spring, after the commencment of hot weather, and disappear in the early part of September. They retire into dens, caverns and cavities in the rocks, where they pass into the torpid state, and remain till roused by the vernal heats.

They do not inhabit all parts of the State, but certain districts.

They are found on Long Island and Manhattan Island; in some parts of the Highlands; around the head of Lake Champlain; at and around Lake George; at Glenville, in the county of Schenectady; at the Nose, in the county of Montgomery; along some parts of Unadilla and Susquehannah rivers; at Lenox and Sullivan, in the county of Madison; at Manlius and Onondaga, in Onondaga county; in some parts of the county of Ontario; along Genesee and Niagara rivers; and in many places in the Oak lands, between those rivers, and also east of the former; at several places along the Schoharie creek; at the Heldeberg, in the county of Albany; at Snake Hill, near Newberg, and in some other places. They have a predeliction for oak lands.

In some of the districts and tracts mentioned, they were very numerous before improvments were made; but the numbers have been greatly reduced since then, by man, swine, and the conflagrations incidental to clearing lands. In some instances, several hundreds have been killed in the spring, at a single den. The usual mode, after finding a den, is to go to it in a hot day, and lie in wait till they come out to bask in the sun, and then sally upon them, and kill them. Some years ago, three hundred were destroyed in this way, at a den near the head of Canandaigua lake: fifteen hundred have

been killed, in one season, around Lake George, and mostly in this manner.

They swim across rivers and lakes, and occasionally make excursions of four or five miles. They have also been known to emigrate from one place to another.

It is not known how many young the female has at a time, nor is it known whether she produces oftener than once in a year or not. From twenty to thirty eggs have been frequently found in such as have been killed. Judging from this, the number of the young cannot fall much, if any, short.

The rattle-snake is capable of long abstinence. It has been known, when confined, to live five or six months without meet or drink, or any sustentation whatever. In most instances, and as far as we have been able to learn, it utterly, when in captivity, refuses food and drink. We have seen some that had been confined upwards of four months, and had taken no sustenence; yet they had lost very little flesh, and seemed to possess nearly the same activity as though at large.

The rattle-snake is found in all the United States, from latitude forty-four or five, southwardly. There are several species, but the one we have described, is the only one found in this State.

The rattle-snake has been so far domesticated as to be handled by its keeper, and made to perform several tricks; but it is an extremely dangerous animal, and has seldom failed to bite its master.

The pilot is found in some of the southern counties, bordering on New-Jersey and Pennsylvania. It is less than the preceding. Its bite is said to be equally poisonous. By some, this snake is called the copper-head, and by others, the rattle-snake's mate. They are numerous in Pennsylvania and Ohio.

The small brown adder is about a foot, and in some instances, fifteen inches in length. Its bite is poisonous. On the approach of danger, it throws itself into a spiral figure, flattens its body, and changes colour, appearing spotted. It inhabits rocky places.

The house adder is much larger. Its bite is fatal, unless medical aid be called in.

The water adder inhabits wet places adjoining streams, rivers, ponds and lakes. It lives partly on land and partly in the water, both elements being necessary to its existence.

The black snake inhabits various parts of the State; it, however, is found mostly in the southern and southeastern counties. It is of various lengths, being from three to five or six feet. It is slender, and of a shining black, except the belly, which is whitish. It runs with great celerity, holding its head a foot or fifteen inches high. It ascends small trees and bushes, by twining itself around their trunks, and perches upon the limbs. It subsists on frogs, toads, mice, squirrels, birds, &c. It is not poisonous.

Besides the black snake above mentioned, there is another species of black snake, which is from two and a-half to three, or three and a-half feet in length. It is much thicker, in proportion to its length, than the foregoing. Its movements are slow. It is not poisonous.

The striped snake is from one foot six inches to three feet in length, and slender. Its name is derived from its colour. It is the most common of all the snakes, and is found in every part of the State. It is harmless. The colour of its belly is whitish, tinctured with green. Its back and sides are black and white, disposed in lines. The black lines are much the broadest. On being overtaken, it turns and faces its enemy, throwing its body in a spiral form, and flattening itself, it becomes spotted; at the same time it opens its mouth and darts its head, displaying its forked tongue. It lives on toads, frogs, mice and other animals. Like others belonging to the serpentine tribe, it will swallow an animal twice or thrice its own diameter. It then becomes almost helpless, being scarcely able to quit its position, till its digestive organs have macerated, softened, and disposed of the animal which it had inhaled.

The green snake is less than the striped snake. It is found in swamps. It derives its name from its colour. It is inoffensive.

The red bellied snake is found in swamps and marshes. It is not very common. In size it falls short of the green snake.

Its belly is red, and its back and sides are brown. The brown is not every where the same, being variable, and of different shades.

The milk snake is from three to four feet in length, and moderately slender. The colour of its back and sides is a lightish brown, with some white, giving it a banded appearance.

The water snake dwells in creeks, rivers, ponds and lakes, bordered by marshes.

All animals belonging to the serpentine order, retire very early in autumn to dens and cavities in the earth, where they insensibly pass into the torpid state, and continue in it till reanimated by the vernal heats. Rattle-snakes repair to dens in larger numbers than any of the other kinds. In spring, after a succession of warm days, they are known to come out and expose themselves to the genial warmth of the sun, for several days in succession, before they separate and take their departure for the season. They lie at first in heaps, are languid, and possess but little animation. By and by they regain their strength and vivacity, and quit their retreat. Sometimes, however, they are overtaken by cold, and relapse again into the same state from whence they had just come. The striped snake appears earliest and latest, being seen as early as the first of April, and as late as the twenty-fifth of October, in some years.

The appearance of these animals depends very much upon the season. If the weather is warm, it requires but a few days to summon them from their hybernation.

Different kinds of snakes have, in some instances, been known to take up their hybernation in the same cavity, den, or place, and spend the winter together in the torpid state.

We shall conclude this chapter with some observations on the fish found in the waters of this State.

Shad—These fish, in April and May, ascend the Hudson, Delaware and Susquehannah rivers, and their branches. The greatest numbers are found in the Hudson. At present they go up no farther than the dam at Troy. Formerly they proceeded as high as Baker's Falls, above Fort Edward.

During their run, and for some weeks after, great numbers are caught in nets. The fishing grounds of the Hudson are extensive.

Herring—These fish also run up the Hudson as far as the dam at Troy, and are taken in considerable numbers.

Before the waters of the Hudson were obstructed by dams, they passed up to Baker's Falls. They formerly visited Saratoga lake in large numbers.

The shad and herring never came up the Delaware and Susquehannah in such numbers.

In former times, the shad as well as the herring, went up the Susquehannah, to Otsego lake, its source.

Sturgeon—These fish ascend the Hudson in considerable numbers. They are commonly taken by spearing.

Salmon—This fish, it is said, formerly abounded in the Hudson. Captain Henry Hudson, in his journal, remarks, there are great plenty of salmon in this river.

Mackerel—Several species of this fish, are caught in the seas and ocean adjoining the State.

Bass—This fish is taken in all its varieties in the seas and ocean, neighbouring upon the State.

Cod—All the species belonging to this genus, are caught in the ocean bordering the State. They, however, are not numerous.

Whale—This fish is occasionally seen and taken on the coast. Formerly, considerable numbers inhabited the ocean neighbouring to Long Island.

The dolphin, porpoise, sword fish, &c. are also found in the same ocean.

Sharks—Of these there are several kinds in the seas and bays of this State.

Lake Salmon—This fish inhabits lakes Champlain, Ontario and Erie.

The salmon of these lakes are different from those of Connecticut river, &c. They live all the year in fresh water.

Before mill dams were constructed on the streams running into

Lake Champlain, the salmon ascended most of them. At present, they run up only such as are unobstructed. In this State, they still go up Sable river, and some other streams. In former times, great numbers went up the Saranac.

The best salmon fisheries are these of Lake Ontario, Big Salmon river, and the Oswego, and its branches. In the former stream, they ascend as far as the falls, in the town of Orwell. In the latter, they run up the Oneida river and lake, and from thence into the streams that fall into that lake.

Salmon are also taken in Little Salmon river, Big and Little Sandy creeks, and the mouth of Black river.

Salmon river, however, affords the best fishing grounds. Several thousand barrels are every year packed on the banks of this stream. They are caught in the spring and fall.

Salmon trout, a fish little inferior to the salmon, abounds in the same lakes, and also in Lake George, and many of our other lakes. They weigh from three to thirty-three pounds.

Trout—This fish is found in most of the rivers, streams, lakes and ponds in the primitive tracts. There are several kinds. In size, they vary from half a pound to three or four pounds.

Trout are also found in some of the waters in the transition and secondary tracts.

Pike—This fish is found in lakes Erie, Ontario, Champlain, George, Oneida, Cayuga, Seneca, &c. and in the Mohawk, Oneida, Seneca, and some of our other rivers and streams. It is an excellent fish. Its dimensions vary considerably. In some of the lakes, it occasionally weighs from twenty to thirty pounds. In the Mohawk, and some other streams, its usual weight is between two and four pounds; instances now and then occur of its exceeding twelve pounds. The pike is very voracious, devouring all the smaller fish which it can sieze.

Pickerel—The pickerel, which resembles the pike in disposition and habits, dwells in lakes Champlain, Ontario, Erie, and some other waters of this State. It weighs from three to upwards of thirty pounds.

Bass—The bass of lakes Erie, Ontario, Oneida, Otsego,

George, &c. weigh from two to five pounds. The kind known by the names of Otsego and Oswego bass, is a delicious fish, equalling the best fish taken in the ocean.

The white fish is an inhabitant of lakes Ontario and Erie. In form it very much resembles the shad. Its weight varies from three to six pounds. They go in shoals. The white fish is in considerable estimation. It, however, is inferior in richness and flavor to the salmon, salmon trout, and bass. They are usually caught in nets and seins.

Sciscoes—These fish also go in shoals, and are about as large as the herring taken in the Hudson. Great numbers are annually caught with nets in Chaumont bay, and other places around Lake Ontario.

Upwards of four thousand barrels have been salted in one year at the latter bay.

Lake Erie is well replenished with white, and other fish.

Lake Sturgeon—This fish is found in lakes Champlain, Ontario and Erie. It is a fresh water fish. Its usual size is from four to six feet.

Chubb—There are two kinds of fish called by this name, the lake and river chubb.

The lake chubb, called by some the dace, inhabits lakes Champlain, Ontario, Erie, Oneida, Cayuga and Seneca, and most of the rivers and streams passing into those lakes. It is a beautiful fish, weighing from one to four or five pounds.

The dace at present inhabits the Mohawk, but it is a new comer. The first ever seen in this river, were, after the construction of the canal at Rome, which unites the latter river and Wood creek. Since then the numbers have greatly increased.

Perch—Yellow and white perch are abundant in lakes Erie, Ontario, Champlain, Oneida, Cayuga, Seneca, and Canandaigua. They are also found in our rivers and streams. They weigh from half a pound to two or three pounds.

CHAPTER XV.

TREES, SHRUBS, PLANTS, &c.

In this chapter we intend to do little beyond giving lists of such trees, shrubs and plants as are native, and such as have been imported, and are known, in a measure, to our citizens. These lists, we think, cannot fail to interest a portion of readers. The same course has been pursued by those who have written histories of some of our sister States.

White cedar	Thuja occidentalis
Red cedar	Juniperus Virginiana
Pine	Pinus
White pine	Pinus strobus
Yellow pine	Pinus pinea
Pitch pine or Black pine	Pinus tæda, Pinus nigra
Larch	Pinus larix
Hemlock	Pinus abies
White spruce	Pinus candida Canadensis
Black spruce	Pinus nigra Canadensis
Fir, or balsam	Pinus balsamea
Ground hemlock, or creeping hemlock	Pinus abies terrestris
Pepperidge	
Tamarac	Tamarix
Oak	Quercus
White oak	Quercus alba
Red oak	Quercus rubra
Black oak	Quercus nigra
Chesnut oak	Quercus prinus
Swamp oak	Quercus humus
Shrub oak	Quercus fruticosus

Dwarf shrub oak	Quercus pumila
Chesnut	Fagus
Chesnut	Fagus castanea
Red beach	Fagus rubra
White beach	Fagus candida
Swamp beach, or blue beach	Fagus humus
Walnut, or white hickory	Juglans alba
Shag bark walnut	Juglans alba cortice squamosa
Black walnut	Juglans nigra
Butternut	Juglans alba cortice cathartico
Button wood, plane tree	Platamus occidentalis
Horn beam, or iron wood	Carpinus betulus
Sugar maple	Acer saccharinum
Red maple	Acer rubrum
White maple	Acer negundo
Curley maple	
Swamp maple	
Mayberry, a small tree bearing red berries.	
White ash	Fraxinus excelcior
Black ash, or swamp ash	Fraxinus nigra
Prickly ash	Fraxinus aculeata
Mountain ash	
Birch	Betula
Black birch	Betula nigra
Yellow birch	Betula lenta
White birch	Betula alba
Alder	Betula alnus
White elm	Ulmus alba, aut ulmus Americana
Red elm	Ulmus rubra
Slippery elm	Ulmus lubrica
Bass wood, or lime tree	Tilia Americana

White wood, or tulip	Tulipa
Linden	
Black locust	Robinia pseudo acacia
Laurel	Laurocerasus laurus
Sassafras	Laurus sassifras
White poplar, or aspen	Populus tremula
Black poplar, or balsam	Populus nigra
White willow	Salix alba
Yellow willow	Salix
Red willow	Salix rubra
Weeping willow	Salix babylonica, aut salix flens
Fragil, or crack willow	Salix fragiles
Dog wood	Cornus sericæ, aut Florida
Button wood, button tree, or pond dog wood	Cephalanthus occidentalis, aut cephalanthus Americana

It is rather a shrub than a tree, and does not attain much height.

Black cherry tree	Prunus Virginiana, cerasus nigra
Choke cherry tree	Cerasus strangulans
Red cherry tree	Cerasus rubra
Cucumber tree	Magnolia acuminata
Papaw	Anona triloba
Red plumb tree	Prunus rubra
Yellow plumb tree	Prunus lutea
Thorn tree	Prunus spina. 2or more species
Crab apple tree	Pyrus caronaria
Juniper	Juniperus sabina
Hazelnut (tree)	Corylus avellana
Witch hazel	Hamamelis
Moose wood, or leather wood	
Brush wood	Vimen, or salix viminales Several species
Spice wood	Lignum aromaticum
Ferns.	Felices. Several species

Shoemake	
Large shoemake	
Small shoemake	
Cranberry	Vaccinium oxycoccos
Bush cranberry	Vaccinium
Black currant	Ribes nigra
Smooth gooseberry Prickly gooseberry	Ribes plana grossularia Ribes spinosa. Several varieties
Large whortleberry	Vaccinium magnum
Small whortleberry	Vaccinium parvum
Black elder	Sambucus nigra
Red elder	Sambucus rubra, aut viburnum opulus
Barberry	Berberis vulgaris
Mulberry	Morus nigra
Billberry	Vaccinum corymbosum
Blue berry	Vaccinum
Choke berry	Vaccinum
Black raspberry	Rubus nigra
Red raspberry	Rubus Canadensis
Patridge berry	Arbutus veridis
Pigeon berry	Cissus
Upright blackberry	Rubus fructicosus
Climbing blackberry	Rubus ascensus
Brambleberry	Rubus occidentalis
Running blackberry	Rubus moluccanus
Cloud berry	Rubus camæmorus
Black grape	Vitis labrusca
Blue grape	Vitis cærulea
Fox grape	Vitis vulpina
Wild hop	Humulus lupulus
Strawberry	Fragaria vesca. Several varieties
Dew berry	Rubus cæsius

Esculent Plants, &c.

Wild leek	
Wild onion	
Wild oat	Zizanicea quatica

Wild pea	
Indian cucumber	Medeola
Mandrake	

Medicinal Plants, &c.

Angellica	Angellica sylvestris
Arsmart	Pollygonum saggittatum
Blue flag	Iris (cæruleo colore inflectus)
Sweet flag	Acorus calamus
Black snake root	Actea racemosa
Blood root	Sanguinaria
Seneca snake root	Polygalia senega
Elecampane	Inula helenium
Garget	Phytolæca decandra
Ginseng	Panax trifolium
Spikenard	Nardus
Sarsaparilla	Aralia
Gold, or golden thread	Nigella
Clivers	Gallium spurium
Dragon root	Arum
Lobelia	Several species
Lilly	Many species
Pond lilly	Nymphæa
Marsh lilly	Nymphæa palustre
Liquorish root	
Marsh mallow	
Mallow	Malva rotundifolia
Maiden hair	Adianthus pedalus
Petty morrel	Aralia nigra
Pleurisy root	Asclipias decumbens
Solomon seal	Convallaria
Serma	Cassia ligustrina
Skunk cabbage	Arum Americanum
Wild rose	Rosa sylvestris
Burdock	Arctium
Plantain	Plantago. Several species

Poke weed	Perula
Horse raddish	Cochlearia armoracia
Water horehound	
Winter green (upright)	
Running, or creeping winter green	
Worm wood	Artemisia absinthium
Colts foot	
Euphorbia	Euphorbium
Rheubarb	Rheum
Thorn apple	Datura stramonium
Hen bane	Hyoscyamus niger
Night shade	Solanum nigrum
Creeping ivy	Rhus radicans
Swamp sumack	Rhus toxicodendrum
Baneberry	Actæa spicata
White hellebore	Veratrum album
Great plantain	
Marsh plantain	
Comphrey	
Bittersweet	
Cow parsnip	Said to be possessed of valuable medicinal properties
Spice wood, or fever wood	
Slippery elm	The bark is a most excellent mucilage
Marsh rosemary	
Adder tongue	
Black elder	Sambucus nigra
Red elder	Sambucus rubra
Sassafras	Laurus sassifras
Prickly ash	Fraxnius aculeata
Dog wood	Cornus Florida
Horse mint	Mentha
Water mint	
Penneroyal	

Hedge nettle
Motherwort
Tansey
Wormwood
May weed
White walnut
Butternut
Swamp willow
Spleen wort
Lung wort

Of medicinal plants, &c. we have enumerated about seventy, but these falls far short of the number. Our catalogue extends but little beyond such as are known to most persons. There is scarcely a section of country but what affords some variety.

Alimentary Herbs or Plants, &c.

1. *Such as are Indigenous.*

Indian corn* (Maize)	*Z*ea mais. Many varieties, such as the white, the yellow, &c.
Wild rice	Folle avoine. *Z*izania
Potatoe	Potato. Solanum tuberosum. Several varieties.
Pumpkins	Cucurbita pepo. Several varieties
Squashes	Cucurbita melopepo. Several varieties
Tobacco	Nicotiana
Broom corn, or broom rape	Orobanche. Exotic

* In the eastern continent, wheat is the most common grain, but in the western, corn has always been and still is the most general; it is produced in all parts of Canada, the United States, and their territories, in Mexico, Guatimala, Peru, Chili, Columbia, the West Indies, &c.

2. *Such as are Exotic.*

Wheat	Triticum. Two species, the winter and spring wheat. These are subdivided into varieties
Rye	Secale. There are two species, winter and spring
Barley	Hordeum. There are two species besides varieties
Oats	Avena. Several varieties
Buck wheat	Tragopyrum
Pease—pea	Pisum sativum. There are several species, each of which contains varieties
Bean	Faba, aut vicia. There are many species. The varieties are almost endless. They are both bush and climbing
Turnip	Brassica rapa. There are several varieties
Cabbage turnip	Brassica
Swedish turnip—ruta baga	Brassica
Cabbage	Brassica. Several kinds
Musk mellon	Cucumis melo. There are varieties
Water mellon	Cucumis. Several varieties
Cucumber	Cucumis sativus. There are several species, and many varieties
Gourd	Cucurbita. Several kinds
Beets	Beta. There are several species and varieties
Carrots	Daucus. There are several kinds
Wild carrot	Daucus carota

Parsnip	Pastinaca sativa. There are several varieties
Wild parsnip	Pastinaca
Raddish	Raphanus sativus. Several species and many varieties
Artichoke	Cynara scolymus
Onion	Allium cepa. Several species and many varieties
Garlic	Allium sativum. Several varieties.
Leek	Porem Canadense
Scives—chives—cives	Allium schoenoprasum
Celery	Apium graveolens
Asparagus	Asparagus officinalis. There are two varieties
Parsley	Apium petroselinum. Several varieties
Endive	Cichoreum endivia. There are two or three varieties
Rape, or coleseed	Brassica napus
Sallet	Acetaria. Several species and many varieties
Lettice	Lactuea sativa. There are many kinds
Mustard	Sinapis
Sage	Salva officinalis
Savory	Satureja
Saffron	Crocus. Two species
Red pepper	Capsicum
Camomile	Anthemis nobilis
Poppy	Papaver
Tansey	Tanacetum, aut athanasia
Hoarhound	
Hops	Lupulus

Exotic trees, bearing fruit, &c.

Apple tree	Pyrus malus. There are numerous varieties
Quince	Malus cotonea, vel cydonia Several varieties
Apricot	Maulus Americana. Several varieties
Pear	Pyrus communis. There are several varieties
Crab apple tree	Pyrus caronaria
Peach	Malus persica. There are numerous varieties
Plumb tree	Prunus
Black blumb	Prunus nigra
Blue plumb	Prunus cærulia
Damsen	Prunus damascena
White plumb	Prunus alba
Red plumb	Prunus rubra
Damask	Prunus. Several varieties
Blue gage	Prunus
Green gage	Prunus
White gage	Prunus
Cherry tree	Cerasus
Black cherry	Cerasus nigra. There are several varieties
Red cherry	Cerasus rubra. Several varieties
Tartarian cherry	Cerasus
Currant	Ribes
White currant	Ribes candida
Red currant	Ribes rubra
* Gooseberry	Ribes grossularia
Smooth fruited gooseberry	Ribes uva crispa
Rough fruited gooseberry	Ribes spinosa

Grape. Several varieties of each

* Whether the gooseberry, cultivated in our gardens be exotic, or indigenous, we are unable to say: one thing is certain, and that is this, it is found in all its varieties in the woods.

All the fruit trees yield abundantly, and their fruit is as fine as in their native country. Some have improved in quality. Most thrive, and do well in all parts of the State, while others are found to flourish only in particular districts. The peach may be instanced. This tree thrives, and does well in the maritime counties, and those along the Hudson, as far north as forty-two degrees. In the west, it is found to flurish in the country south of Ontario, and north of the hills of Chenango, Cayuga, and the Chatauque ridge. The best are in the county of Genesee. Here the fruit is very delicious, and not inferior to that along the Potomac.

Apples, pears and quinces have a much finer flavour, are richer and larger, and afford more nutrition than those of England. The maritime, Hudson, and western counties, yield the best fruit.

Cultivated Grasses.

Timothy	Phelum pratense
Fox tail grass	Alopecurus
Bent grass	Many species
Wire grass	
Fowl meadow grass	Many species
Rye grass	Lolium peuenne
Green sward grass	
Blue grass	
Crabb grass	
Hair grass	
Sedge grass	Cavex
Red clover	Trifolium pratense
Yellow clover	Trifolium
White clover	Trifolium rupens
Lucerne	Medicago sativa
St. Foin	Hedysarium onybrichis
Hemp	Datiska. There are two species
Hemp	Datiska cannabina
Hemp, or bastard hemp	Datiska hirta
Flax	Linum. Several species

Indigenous grasses that are not cultivated.

Vernal grass	Anthoxanthum odoratum
Timothy, bulbous, cat's-tail, puss grass	
Hair grass	
Sofa grass	
Meadow grass	Poa. Several species
Quack grass, quacking grass	Several species
Beard grass	Several species
Millet	Several species
Cock's foot grass	Dactylis glomerata
Oat grass	Several species
Fesque grass	Several species
Barley grass	
Reed grass	Several species
Broom grass	
Couch grass, or dogs grass	
Rush grass	Many species
Carex. Sedge grass	Numerous species. Mostly in fresh and salt marshy grounds

Remarks on some of the trees, &c.

Cedar occurs in the Oneida and Seneca vale, and various other parts of the State. The white is most abundant. In certain instances, it covers swamps, containing several thousand acres. Some of the trees are large, being four feet in diameter. Trees of two feet are common. Cedar is used for fencing, and various other purposes. The red cedar is not so abundant as the white. It is in high estimation for ship timber, and other uses, on account of its lightness and durability.

The white pine is the tallest tree in our forests, frequently attaining the height of one hundred feet. It is chiefly found in the primitive and transition formations. It used to be very abundant in the counties situated along the middle and upper parts of the Hudson. It is still abundant in the forest between the Mohawk and St. Lawrence rivers. It grows mostly on loamy, sandy and gravelly soils.

White pine, in some of our counties, has formed a considerable item in commerce, under the denomination of lumber. It is extensively used in building houses, barns, &c.

In some parts of the State, the pine is remarkable for an excresence, which grows from the body. This excresence is round, sometimes attaining eighteen inches in length, and a diameter of six or seven inches. Its external colour is a lightish grey, and its internal, whitish, resembling, in appearance, dry rotten wood. The cover is a rind. It is very bitter.—When grated or pulverized, and put into spirits, and taken as a bitter, it is considered strengthening and wholesome. The people call it pine bitter.

The yellow pine and pitch pine are used for the floors of houses and the decks of vessels. The former grows in the same kinds of soils with the white pine, but the latter is found principally on sandy and gravelly soils. The Albany, Saratoga, Oneida, and other sandy and gravelly plains are mostly timbered with it. Its diameter rarely exceeds two feet, and its height seventy. When burnt in kilns it makes the best of charcoal; its knots and roots being full of terebinthine oil, when kindled, afford a brighter light than candles; its soot is collected and used for lampblack. Tar is also made from it.

Pines occasionally attain the height of one hundred and seventy feet, with a circumference of twenty-four.

Hemlock grows on most soils; it is, however, found in the greatest abundance between Lakes Champlain and Ontario, and the Mohawk and St. Lawrence rivers. It is frequently an attendant of the pine. In general, there is very little of it in the secondary formations. It is at present made into boards and planks, and is used for buildings in those parts where the white and yellow pine have become scarce. The hemlock often attains great magnitude. It is no unusual thing to see trees eighty or ninety feet high, and four or five feet in diameter, at the base. The trunk is straight.

The ground hemlock seldom exceeds two or three feet in height. It grows on cold, moist lands. In some places it covers the ground.

Spruce is of most frequent occurrence in the country between the Mohawk and St. Lawrence rivers. It constitutes no inconsiderable portion of the forest trees. Boards, planks, and shingles are made of it in those parts where there is no pine, or where there is a scarcity. It is also used for masts and spars.—Spruce beer, a cheap wholesome beverage, is made from a decoction of its leaves and branches. The spruce is a slender tree, gradually ending in a point. There are two kinds, the white and the black. Both grow in the same forest.

The fir, or balsam, grows in the same region, but it is not so frequent as the spruce. It affords a resinous liquid substance, which is highly efficacious in several disorders. The liquid is obtained from pustules by incision, during the summer months.

The oak occurs in all the counties in the State, but it is more plentiful, and of greater magnitude and beauty in the secondary formation. In several of the western counties it is the predominating timber. The trees are tall, straight, and vigorous, and are occasionally six or seven feet in diameter. The white oak is found in greater numbers than the other kinds, and is made into staves, plank, rails, &c. Since the opening of the Erie canal, large quantities of staves and timber have been floated in rafts upon its waters, to the navigable parts of the Hudson, and from thence to the city of New-York.

The black oak is a stately tree. It is used by the farmers for fencing. Coopers sometimes use it in the fabrication of hogsheads, barrels, &c.

The shrub oak grows in sandy and gravelly plains, and is of little value. It abounds in the plains along the Hudson, and in those on Long Island.

The chesnut is a majestic tree, with a straight trunk and wide spreading branches. The only use made of the timber is for fencing. In Europe, the chesnut ranks next to the oak, and is used for mill timber, rafters, columns, bedsteads, tables, chairs, &c.

In Italy, Sicily, Corsica and France the chesnut is planted in groves and cultivated solely for its fruit, which is considered wholesome and nutritious. As an ornamental tree, it possesses considerable beauty. Between the Erie canal and Lake Ontario there still remain many fine groves. The chesnut occasionally attains a diameter of eight feet.

The black walnut grows in some of the western and southern counties, but it is not so large and stately as in Ohio, Kentucky, and other southern climes. The wood is in considerable request for gun-stocks and furniture. It takes an elegant polish.

It might be easily introduced into most of the counties, and naturalized, since it has been found to thrive very well in several places, where planted as an ornamental tree. On the borders of Lake Erie it has occasionally attained the diameter of six or seven feet.

The butternut is both useful and ornamental. The fruit is nutritious. The wood is used for several purposes, and the bark for dying, &c.

The white ash is a tall stately tree. It grows spontaneously in most or all of the counties. It is used for various purposes. It attains the largest size in the secondary formation.

The white elm abounds in the transition and secondary formations. In the western and northwestern counties, it grows to a very large size. The circumference of some trees, five feet from the ground, measures from eighteen to twenty-one feet. The trunk is usually straight and the top large.

The button wood, or plane tree, is indigenous to every county in the State. In the primitive and transition formations it grows along the banks of rivers and streams, and in the alluvions bordering them, but it seldom attains much magnitude. In the secondary formation it is of most common occurrence, and of greatest dimensions. On Oswego, Seneca and Genesee rivers, trees have measured between thirty-five and forty feet in girth, five feet from the ground. In the great plain between Genesee and Niagara rivers, the button wood grows spontaneously on most of the uplands.

The sugar maple is a beautiful and stately tree. It grows chiefly in the secondary and transition formations. It prefers a deep rich soil. Sugar is made from its sap, which nearly equals that made from the juice of the cane. The trees are tapped early in the spring, usually the first of March. The sap is received into troughs and tubs, and collected together and boiled. The sap, however, never runs in quantity but in clear weather, and when it freezes by night and thaws by day. A tree of middling size yields, in a good season, from twenty to thirty gallons of sap, from which may be made from five to six pounds of sugar. The season ordinarily lasts from four to six weeks. Individuals have, in some instances, made from eight to ten thousand weight in a single season. The usual quantity, however, is much less, seldom exceeding four or five hundred weight. Many families have long supplied themselves plentifully with this sugar.

The Indians in this State and Canada are said to have made sugar anterior to the colonization. The quantity made lessens as the woods are cut down. There are many districts, in which large quantities were formerly made, which, at present, do not afford a pound. In general, no attention has been paid to the preservations of the trees. In addition to this, the snow, where the lands are cleared, go off much earlier, and the seasons have become shorter and more irregular: hence, the trees do not afford so much sap as formerly.

A variety of white maple, called curly maple, is in high estimation amongst cabinet makers. The wood is hard, and very close grained, and takes an exquisite polish. Tables, bureaus, side boards, and other articles of furniture, fabricated from it, vie in elegance with those made of mahogany. Gun and rifle stocks are also made of it. This variety grows in various parts of the State, chiefly in the western counties, and in the Oneida and Seneca vale.

The soft maple grows on moist and swampy lands. When tapped in the spring. it yields abundance of sap, but as it contains very little saccharine, no account is made of it.

The tulip, or white wood grows in the transition and secondary formations, mostly in the latter. In the counties of Niagara, Erie, Chatauque, Genesee, Orleans, Munro, Livingston, Ontario, Wayne, Cayuga, Oswego, Onondaga, Madison and Oneida it is very abundant. In the two latter counties it is found mostly in the low grounds. This remark, however, is applicable to some of the other counties. We rarely see it scattered over the whole country, and growing in all situations before we approach Genesee river from the east. It also occurs in a few places in the county of Herkimer.

The tulip is a stately tree, with a wide spreading top. The trunk is straight, and an ordinary sized tree, rises fifty or sixty feet without a limb. The circumference of a large tree, four feet from the ground, is from fifteen to twenty feet.

The timber is sawed into boards, and used in building honses, barns and sheds. It is in high demand for carriage tops, sleigh boxes and other uses.

The black locust is indigenous to some of our southern counties. It occurs at Randolph, in Chenango ; at Windsor, in Broome ; also, in Orange, and the counties south of the Highlands.

It has been introduced from the south, into several counties, and cultivated as an ornamental tree. The wood is used in ship building.

The sassafras grows spontaneously in every county in the State, but it is only in some of the western counties, that it rises above the rank of a shrub or bush. In some of the counties, between Genesee and Niagara rivers, it attains a circumference of upwards of four feet and rises to the height of sixty. Instances of seeing trees in the forests, from ten to fifteen inches in diameter are by no means unfrequent. It has considerable beauty. The magnitude of this tree exemplifies in a very striking manner, the difference between the climate of this section of country, and the rest of the State. The transition, however, along the line of the canal, and along Lake Ontario is gradual. In setting out from the county of Herkimer and travelling

westwardly, the sassafras increases imperceptibly in size, till it has attained the dimensions above stated.

The black cherry tree grows in every county in the State. In the transition and secondary tracts, it attains the height of seventy feet and upward, with a girth of from four to six feet. The trunk is usually straight and free from limbs. The timber is eagerly sought after by cabinet makers. It is close grained and hard, and takes an elegant polish. Sideboards, bureaus, desks, tables, bedsteads, &c. made out of it, possess great beauty.

The red plumb tree is found in various parts of the State. It is cultivated in gardens with other fruit trees. The red plumb tree, in general, grows on river and creek bottoms, and on the borders of marshes.

The yellow plumb tree grows in situations similar to the preceding.

The bush cranberry grows in and around marshes. The fruit is highly acidulous, and makes excellent preserves. The bushes on the marshes, especially those between the Mohawk and St. Lawrence rivers, are in small coppices.

The black currant bush grows in the woods. The fruit is as large as the red or white currant which grows in our gardens, but the flavour is not so good.

The smooth and prickly gooseberry have for a long period been cultivated with success. There are several varieties. In the domestic state the fruit is considerably improved.

Of grapes, there are at least three kinds; the black, the blue, and the fox grape. These, in general, grow along rivers, creeks and streams. The vines, in some instances, attain a diameter of three or four inches.

Strawberry—Of this plant we have several varieties. The common strawberry grows in meadows and moist places. The fruit is red and equals the domestic cherry in size. It is luscious and exquisite. Very little attention has been paid to the cultivation of this plant, in consequence of the predilection for foreign.

Wheat, rye, barley, oats, buckwheat, pease, beans, &c. grow remarkably well. Most, if not all, have improved in size and quality. It seems that the soil and climate, in many parts of the State, are more adapted to their nature, than those from whence they were imported.

The same observations will apply with equal force to most exotics. All have improved, where proper care and attention have been bestowed to their culture.

Corn (maize) was cultivated by the Indians who inhabited the country, before the arrival of our ancestors. The quantity grown, however, was very inconsiderable, and formed but a small part of their aliment.

Wild rice—This aquatic plant grows spontaneously in some of our rivers and lakes. It occurs in Seneca river at Montezuma, and around the outlet of Cayuga lake. The grain it bears is little inferior to that of the rice grown in and near the torrid zone. This plant might be cultivated on some of our marshes.

Within a few years, wild rice has been transplanted to England and France, where it has been found to thrive and do well.

ERRATA.

Page 34---line 10 from bottom, for *leaves* read *laves.*

60 line 10, for *has* read *have*

72-- line 7 from bottom, for *Chemug* read *Chemung.*

331---line 8, for *and perhaps more* read *and more.*

336---line 4 from bottom, for *Palstine* read *Palatine.*

344---line 2 from bottom, for *Lower* read *Upper Canada.*

359 —lines 11 and 14 from bottom, for *county* read *country.*

385—line 15 from bottom, for *unparalled* read *unparalleled.*

447---line 12 from bottom, for *corum* read *corum,* and for *appellenter, appellantar.*

445—line 15 from bottom, for *canus* read *canis.*

477—line 8, for *distinct* read *extinct.*

478—line 9, for *small* read *tall.*

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